DRAFT

BAY AREA

'97 CLEAN AIR PLAN

and Triennial Assessment

Volume I

September 1997

Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109
Phone: (415) 771-6000
Fax: (415) 749-4741
Web: www.baaqmd.gov

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

WORKSHOP NOTICE

September 23, 1997

TO: INTERESTED PARTIES

FROM: AIR POLLUTION CONTROL OFFICER

SUBJECT: **1997 CLEAN AIR PLAN**
WORKSHOP ON DRAFT CLEAN AIR PLAN

The staff of the Bay Area Air Quality Management District (BAAQMD) will conduct a public workshop to review and discuss the Draft Bay Area 1997 Clean Air Plan (CAP). This plan is a triennial revision to the 1994 Clean Air Plan. The workshop will also review and discuss the region's progress in implementing the 1994 Clean Air Plan, documented in the triennial assessment that is part of the '97 CAP. **The workshop will be held on Tuesday, October 14, 1997, at 9:30 am, in the 7th Floor Board Room at the BAAQMD Offices, 939 Ellis Street, San Francisco.**

Why BAAQMD is Preparing a *1997* Clean Air Plan

The California Clean Air Act of 1988 (CCAA) established a legal mandate to achieve health-based state air quality standards at the earliest practicable date. Although the Bay Area has made significant progress in reducing emissions since the CCAA was enacted (population exposure to ozone levels above the standard has been reduced over 40 percent), the region has not yet attained the state ozone standard. The first plan prepared in this region focusing on the state ozone standard was the *Bay Area '91 Clean Air Plan* (CAP). That plan was last revised in 1994. The CCAA requires the BAAQMD to revise the CAP every three years.

On March 10, 1997, the BAAQMD notified interested parties that it had begun preparation of the '97 CAP. On May 20, 1997, staff held a workshop on proposed new control measures. Public comments were received and have been incorporated. The Draft 1997 CAP is now available for public review and is the subject of this workshop. An addendum to the 1991 Clean Air Plan Environmental Impact Report (EIR) has been prepared pursuant to the California Environmental Quality Act (Public Resources Code Section 21000 *et seq.*) and is also available for review.

Contents and Proposed New Control Measures

The '97 CAP includes a three-year (1994-1997) assessment documenting our progress in implementing the '94 CAP. The triennial assessment summarizes ozone and particulate matter trends, lists adopted control measures and their estimated effectiveness, and documents the region's progress in meeting CCAA transportation performance standards. The emissions inventory has also been revised, and a particulate matter inventory has been added.

The CCAA requires a review of control measures in the '94 CAP to determine whether it includes all feasible measures. Based on that review, staff propose to add 14 new control measures. The new measures will:

Stationary and Area Sources

- Allow Use of Emission Reduction Credits (ERCs) to Mitigate Variances and Violations
- Consider Relative Ozone Reduction of Various Solvents for Further Reductions
- Control Fittings at Refineries and Chemical Plants
- Ease Administrative Burdens in Exchange for Use of Lower Emitting Technology
- Explore Light Colored Roofing and Road Surfaces to Reduce Ozone (by lowering temperature)
- Improve Monitoring of Point Source Emissions to Enhance Compliance with District Regulations
- Promote Energy Efficiency
- Reduce Emissions at Gas Stations
- Reduce Emissions from Stored Organic Liquids
- Require Controls for High Emitting Activities During the Ozone Season

Mobile Sources

- Calculate ERCs for Scrapping Boat Engines and Lawn & Garden Equipment
- Increase Low Emission Vehicles in Fleets

Transportation Control Measures

- Enhance Pedestrian Environments (implemented by cities and counties)
- Promote Traffic Calming (implemented by cities and counties)

Many of these measures require significant research before they can be implemented. The BAAQMD's rule development process invites interested parties to work closely with District staff in developing a draft and final rule or program. This ensures that emissions are reduced through cost effective controls that can be successfully implemented.

Obtaining the Draft 1997 CAP

There are three ways to obtain a copy of the Draft '97 CAP (includes Triennial Assessment) and the Addendum to the 1991 CAP EIR:

- **Call BAAQMD Public Information Office at (415) 749-4900 and request a copy.** To save resources, please request only those volumes of the Plan that are of interest to you:

  Volume 1 - Draft 97 CAP (includes summary of Volumes 2, 3 and 4)
  Volume 2 - Proposed Transportation Control Measures (detailed description of each measure)
  Volume 3 - Proposed Stationary and Mobile Source Control Measures (detailed description)
  Volume 4 - Emissions Inventory
  Volume 5 - Implemented Stationary and Mobile Source Control Measures (detailed description)
  Addendum to the 1991 Clean Air Plan EIR

- **View / Download from the BAAQMD's Website:** *www.baaqmd.gov* (available Sept. 26)
- **Visit a Government Documents Depository Library** (17 throughout the Bay Area)

Commenting on the Draft 1997 CAP

Comments on the Draft '97 CAP may be made at the workshop and/or submitted in writing. All comments are due by October 20, 1997. They should be sent to Jean Roggenkamp, Planning and Transportation Manager, BAAQMD, 939 Ellis Street, San Francisco, CA 94109.

Other Opportunities for Input

We expect to release a Proposed Final '97 CAP in November 1997, and conduct a public hearing before the Board of Directors on the Final '97 CAP in December 1997. However, we encourage you to provide comments on the Draft '97 CAP so that we may consider your comments in preparing the Proposed Final.

For More Information

Call David Marshall, Principal Planner, at (415) 749-4678 for questions about the workshop or the Draft '97 CAP.

If you would like to be removed from our Air Quality Planning mailing list (or direct our mailings to another person at your company or agency), please call **Lilia Martinez** at (415) 749-4664.

SUMMARY

This is a revision to the *Bay Area 1994 Clean Air Plan* (CAP), a plan to reduce ground-level ozone (O_3) air pollution in the San Francisco Bay Area. The '94 CAP included a comprehensive strategy to reduce air pollutant emissions. The '94 CAP focused on control measures[1] to be implemented during the 1994 to 1997 period, and also included control measures to be implemented from 1998 through the year 2000 and beyond. This plan, called the *Bay Area 1997 Clean Air Plan,* is a continuation of the comprehensive strategy established in the region's first plan — the '91 CAP — to attain the state ozone standard. The '97 CAP includes changes in the organization and scheduling of some '94 CAP control measures and also includes 12 proposed new stationary and mobile source control measures, as well as two new transportation control measures. The '97 CAP covers the period extending from CAP adoption, expected in December of 1997, to the next California air quality planning update, expected in 2000. It also includes projections of pollutant trends and possible emission reduction activities beyond 2000.

The CAP was developed by the Bay Area Air Quality Management District, in cooperation with the Association of Bay Area Governments and the Metropolitan Transportation Commission, in response to the California Clean Air Act (CCAA) of 1988, as amended. The goals of the '97 CAP are to reduce the health impacts from ozone levels above the state ambient standard[2] and to comply with the California Clean Air Act. The Act requires air districts that exceed the state ozone standard to reduce pollutant emissions by 5 percent per year, calculated from 1990, or take all feasible measures to achieve emission reductions. The Bay Area attained the state carbon monoxide (CO) standard in 1993, so the CCAA planning requirements for CO nonattainment areas no longer apply to the Bay Area. The control measures proposed in the '97 CAP constitute all feasible measures for the reduction of ozone precursor emissions in the Bay Area.

Population exposure to ozone above the state standard has been cut by 43 percent since the 1986-88 base period. Ozone precursors — reactive organics and oxides of nitrogen — were reduced by about 4.0 percent per year and 2.2 percent per year, respectively, over the planning period 1990-1997.

For the 1997-2000 period, additional ozone precursor reductions will be achieved through:

---

[1] The term "control measure," as used in the CAP, is an action or actions that will reduce emissions of ozone precursors. A measure may take the form of a regulation adopted by the District, a program implemented by the District or others, or transportation improvements implemented by the State or other public agencies.

[2] The California ambient air quality standard for ozone is set at 0.09 parts per million for a one-hour average. There are also national ambient air quality standards for ozone and other air pollutants. This Plan addresses only the state ozone standard.

- increasingly stringent state and federal programs affecting motor vehicles, fuel and other sources, and associated turnover of the motor vehicle fleet;
- more stringent regulations on polluting industries and businesses;
- reformulation of paints and consumer products to reduce volatile pollutant content;
- programs to reduce automobile use and traffic congestion; and
- efforts to maintain and improve public transit systems and to encourage development patterns that reduce automobile dependence.

The specific control measures are listed in the Proposed Control Measures section. More detail on each control measure is provided in Appendices E (Transportation Control Measures) and F (Stationary and Mobile Source Control Measures). The Air District's proposed regulatory schedule is shown in Table 10.

This Plan reflects the Air District staff's projection of future regulatory activity. However, as "planned activities," the control measures are initial proposals subject to the rule development and workshop process, Air District Board consideration, ARB approval, and possibly EPA approval prior to implementation. Accordingly, the proposals contained within the Plan may be modified and should be reviewed with this in mind.

The stationary source rule development process includes many steps, including review of control measures and adopted rules in other regions, consultation with affected parties, development of draft rules, workshops with affected and interested parties, development of technical support documentation including the California Environmental Quality Act (CEQA) and socioeconomic analyses, and rule adoption by the Air District Board of Directors at a public hearing. During this process, new information may become available regarding the availability of technologies, costs of mitigation measures, emission reduction potential, and other factors. As a result of the rule development process, the coverage, exemptions, definitions, or standards may change. Therefore, the estimated emission reductions, cost effectiveness, or scheduling of an adopted rule may be different than indicated in the control measure description in the CAP.

Successful implementation of the transportation control measures is contingent upon adequate funding and authority of implementing agencies, political approval processes, and public acceptance.

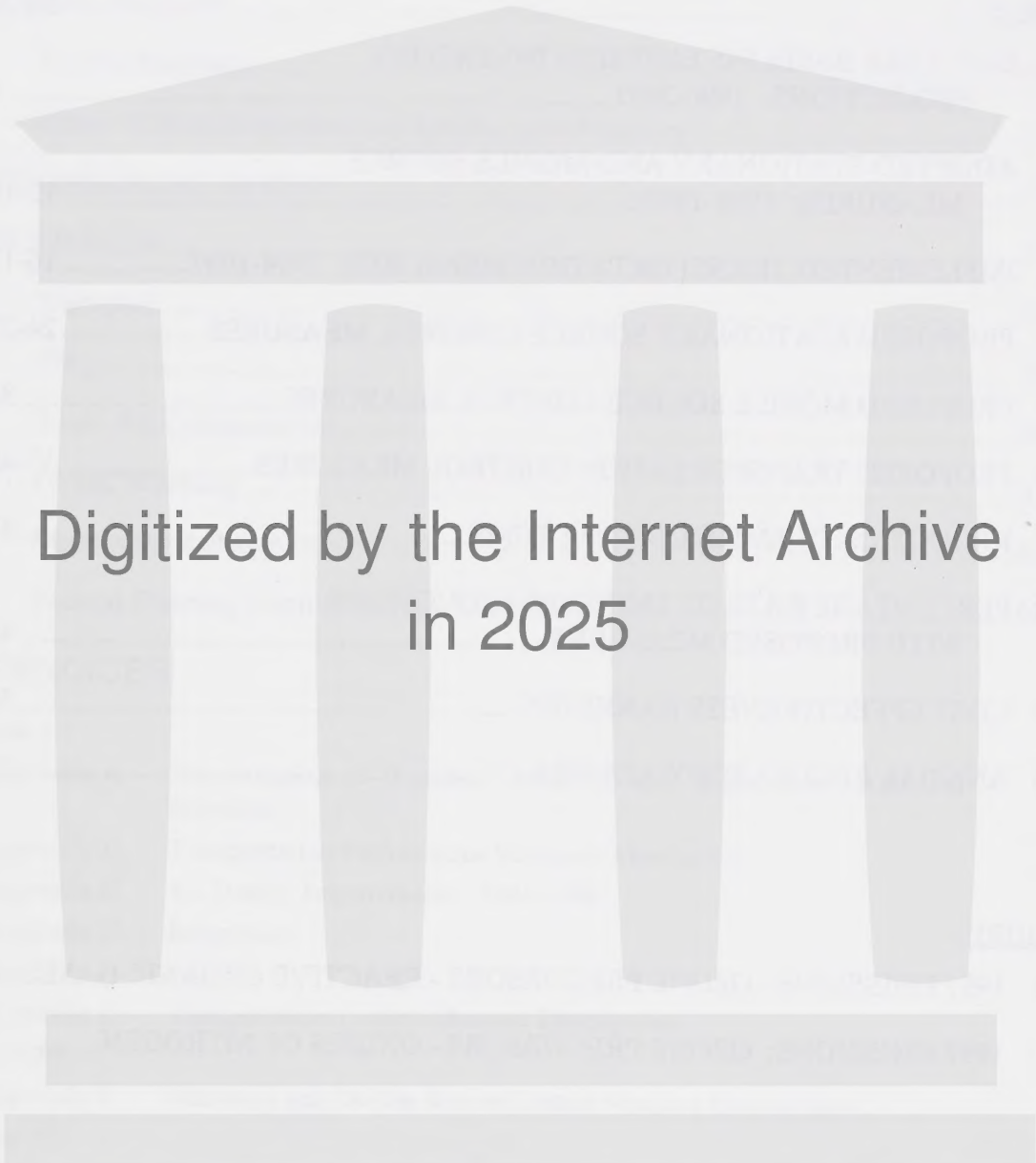
While ozone is not the only air quality problem in the Bay Area, it is the pollutant of primary concern in this Plan. Particulate matter, toxic air pollutants, stratospheric ozone depletion, global warming, and other air quality problems are serious air quality issues, with local, regional and global impacts. The Air District has adopted a separate plan to reduce toxic air contaminants (see page 60). Some of the proposed control measures in the '97 CAP will also reduce particulate matter and carbon dioxide emissions.

The major benefits of the CAP will be reduced health impacts from population exposure to ozone. Additional expected benefits are reductions in: particulate matter, growth of traffic congestion, energy use, global warming, crop damage and water pollution.

TABLE OF CONTENTS

APPENDICES

TABLES AND FIGURES



ABBREVIATIONS AND TERMINOLOGY

'97 CAP 1997 Clean Air Plan

AB	[California] Assembly Bill
ABAG	Association of Bay Area Governments
ARB	[California] Air Resources Board
ATCM	Airborne Toxic Control Measure
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
BAR	[California] Bureau of Automotive Repair
BARCT	Best Available Retrofit Control Technology
BART	Bay Area Rapid Transit District
CAA	[Federal] Clean Air Act
CCAA	California Clean Air Act [of 1988]
CCCTA	Contra Costa County Transportation Authority
CEQA	California Environmental Quality Act
CI	Compression ignition [engines]
CFCs	Chlorofluorocarbons
CMA	Congestion Management Agency
CMAQ	Congestion Management and Air Quality [Improvement Program]
CMP	Congestion Management Program
CO	Carbon monoxide
DV	Design value
EBTR	Employer-based trip reduction
EPA	[United States] Environmental Protection Agency
GG	Golden Gate
HC	Hydrocarbons
HOV	High-occupancy vehicle (carpool, bus, shuttle, etc.)
hp	horsepower
HPMS	Highway Performance Monitoring System
I&M	[Motor Vehicle] Inspection & Maintenance ("Smog Check" program)
IC	Internal combustion [engine]
ICAO	[United Nations] International Civil Aviation Organization
JPB	[Peninsula Corridor] Joint Powers Board
LAVTA	Livermore-Amador Valley Transit Authority
LEV	Low Emission Vehicle
LRT	Light rail transit

MMBTU	Million British Thermal Units
MTC	Metropolitan Transportation Commission
MTOS	Metropolitan Traffic Operations System
MTS	Metropolitan Transportation System
NAAQS	National Ambient Air Quality Standards
NO_x	Nitrogen oxides or oxides of nitrogen
O_3	Ozone
$PM_{2.5}$	Particulate matter less than 2.5 microns
PM_{10}	Particulate matter less than 10 microns
pphm	Parts per hundred million
ppm	Parts per million
PSI	Pollutant Standard Index
PUC	Public Utilities Commission
RFG	Reformulated gasoline
ROG	Reactive organic gases (photochemically reactive organic compounds)
RIDES	RIDES for Bay Area Commuters
RTC	Regional Transit Connection
RTP	Regional Transportation Plan
RVP	Reid vapor pressure (measure of gasoline volatility)
SB	[California] Senate Bill
SCAQMD	South Coast [Los Angeles area] Air Quality Management District
SCVTA	Santa Clara Valley Transportation Authority
SIP	State Implementation Plan (prepared for *national* air quality standards)
TAC	Toxic Air Contaminant
TCM	Transportation control measure
TFCA	[BAAQMD] Transportation Fund for Clean Air
TIP	Transportation Improvement Program
TMA	Transportation Management Association
TOS	Traffic Operations System
tpd	tons per day
USC	United States Code
UV	Ultraviolet
VMT	Vehicle miles traveled (usually per *day*, in a defined area)

INTRODUCTION

Pollutants in the air can cause health problems — especially for children, the elderly, people with heart or lung problems, and exercising adults. The harmful effects of air pollution have been recognized for many years, but scientific studies and legal procedures have been developed only in recent decades to define specific pollutants. Ozone, the principal component of smog, is the pollutant of concern in this Plan.

Ozone is a strong oxidizing agent with the potential to damage living and inanimate things with which it comes in contact. When present in the lower atmosphere, even at low concentrations, ozone is harmful to human health and property. Impaired respiratory function and cardiac stress are the most common health impacts of ozone pollution, but ozone also impairs the body's immune system. Children are most at risk from exposure to ozone because they are active outside, playing and exercising, during the summertime when ozone levels are at their highest. Adults who are outdoors and moderately active during the summer months, such as construction workers and other outdoor workers, are also among those most at risk. These individuals, as well as those with respiratory illnesses, such as asthma, can experience a reduction in lung function and increased respiratory symptoms, such as chest pain and cough, when exposed to relatively low ozone levels during periods of moderate exertion.

At harmful levels, ozone aggravates asthma, emphysema and bronchitis and leads to increased hospital emissions and emergency room visits. Healthy adults may experience symptoms of impaired respiratory function and cardiac stress during periods of intense exercise. There is new evidence of chronic effects from long-term exposure. Repeated exposure to ozone can make people more susceptible to respiratory infection and lung inflammation, and can aggravate preexisting respiratory diseases. Long-term exposures to ozone can cause repeated inflammation of the lung, impairment of lung defense mechanisms, and irreversible changes in lung structure, which could lead to premature aging of the lungs and/or chronic respiratory illnesses such as emphysema and chronic bronchitis.

Ozone also damages trees and other natural vegetation, reduces agricultural productivity, reduces visibility and causes or accelerates deterioration of building materials, surface coatings, rubber, plastic products and textiles.

The state of California has set numerical standards to define unhealthful levels of air pollution. The relevant standard for this Plan is the state standard for ozone (O_3),[3] which is violated if measured ozone exceeds 0.09 parts per million over a one-hour average.

---

[3] Note that ozone near the ground is an air pollutant--an oxidizing agent harmful to people, animals, plants, and many materials. The same chemical compound in the stratosphere, about 10 miles above the Earth's surface, plays a beneficial role in protecting us from excessive ultraviolet radiation. Surface ozone and stratospheric ozone are independent phenomena, and the intent of this Plan is to reduce *surface* ozone only.

In most parts of the San Francisco Bay Area, air quality is good and is improving. Nevertheless, state standards are sometimes exceeded. In recent years, the state ozone standard has been exceeded 10 to 35 times per year on hot summer days in the inland valleys of the Bay Area. The year-to-year variation in the number of exceedances is due in large part to meteorology. Hot summer days produce conditions conducive to ozone formation — the hotter the summer, the greater the number of exceedance days.

Because the region exceeds the state ozone standard,[4] the Bay Area Air Quality Management District (BAAQMD or Air District) has prepared this *Bay Area '97 Clean Air Plan* (CAP). Control measures in the CAP will reduce two precursors to the formation of ozone — reactive organic gases (ROG) and oxides of nitrogen (NO_x). This Plan is the third in a series to be prepared at three-year intervals, as required by state law. The '97 CAP includes control measures[5] proposed for the period from 1998 through 2000. Control measures are also proposed for 2001 and beyond but they will be reconsidered in the next CAP revision expected in 2000. The '97 CAP also assesses the region's progress in meeting the state ozone standard since adoption of the '94 CAP. The '94 CAP projected that by 1997, regional control measures aimed at curbing ozone would reduce ROG by 10 tons per day and NO_x by 5 tons per day. Collectively, the '94 CAP's stationary source, mobile source and transportation control measures (TCMs) that will be adopted or implemented through December 1997 are expected to result in a 9.5 ton per day reduction in ROG, a 2.1 ton per day reduction in NO_x, and a 5 ton per day reduction in PM_{10}. Total reductions from federal, state and regional programs since 1994 were 84 tons per day of ROG and 64 tons per day of NO_x. PM_{10} emissions have increased 19 tons per day.

Since 1994, there have been some delays in Air District adoption of rules to reduce stationary source emissions. These delays have been largely due to the reduction in agency staffing and long lead times required to research issues associated with rule development. For TCMs, shortfalls in transportation funding (from both state and federal sources) resulted in more modest implementation of TCMs than was expected in 1994. In addition, commitments to major expansion projects, rehabilitation of existing facilities, and seismic safety needs stemming from the Loma Prieta and Northridge earthquakes continued to consume limited revenue slated for transportation control measures.

---

[4] The State ozone standard is 0.09 parts per million. California Health and Safety Code Section 40921.5 identifies classifications for air basins based on their ambient concentration of ozone, excluding exceptional events. The Bay Area's ozone concentration is between 0.13 - 0.15 parts per million, which corresponds to a "serious" classification.

[5] The term "control measure", as used in the CAP, is an action or actions that will reduce emissions from ozone precursors. A measure may take the form of a regulation that is adopted by the District, a program that is implemented by the District or others, or transportation improvements that are implemented by the State or a Bay Area transportation agency.

Although the progress in Air District adoption of stationary source measures and the region's progress in TCM implementation is less than we had hoped for in 1994, the cumulative progress in implementing stationary and mobile source measures and TCMs since 1991 has been substantial. Emissions of ROG have been reduced over 4 percent per year, approaching the California Clean Air Act's target of 5 percent per year and greater than the 3.8 percent per year the Air District had, in 1991, expected to achieve by 1997. Thus, although the specific mix of controls that have been implemented differs, the region's progress in reducing emissions is similar to expectations in the *1991 Clean Air Plan.*

If our progress in improving air quality is to continue, a new transportation revenue source that devotes funding to TCMs is necessary in California. By emphasizing the federal theme of maintaining our highways and transit facilities and making investments that increase the efficiency of existing facilities in new Bay Area transportation revenue proposals, the proportion of funding allotted to TCMs would likely increase.

The region's long-term population growth rate is expected to be lower than was estimated in 1994 (1.1 percent per year versus the 1994 estimate of 2.0 percent per year). The number of miles driven by Bay Area residents is also expected to increase at a slower rate than was estimated in 1994 (1.4 percent per year versus the 1994 estimate of 1.7 percent per year). The number of vehicle trips made by Bay Area residents is expected to increase at a slightly higher rate than was expected in 1994 (1.8 percent per year versus the 1994 estimate of 1.7 percent per year).

A comparison the 1994 and 1997 Clean Air Plans will reveal that, for the same years, the amounts of air pollution are not the same. In fact, they differ even for prior time periods. This is largely due to new emissions factors and improved forecasting techniques, actual data on past activity, and better forecasts of future activity. New emission factors applied to revised forecasts of population, employment, vehicle miles traveled (VMT) and industrial growth yield estimated levels of ozone precursor emissions in the year 2000 that differ slightly from those outlined in the '94 CAP: 2 percent less for reactive organic gases and 9 percent higher for nitrogen oxides.

Although we now project that the year 2000 level of NO_x emissions will be higher than we projected in 1994 (due to changes in emission forecasting, not actual emission increases), the expected percentage reduction in NO_x between 1997 and 2000 (11%) will more than double from the percentage reduction forecasted in the 1994 CAP (5%). ROG emissions will also decline faster than previously thought during this period. This means that air quality will improve more quickly than we previously thought, since the downward slope of the emissions line is steeper. The greater percentage reductions will enable the region to make additional progress toward attaining the state ozone standard, but not enough to reduce the stringency of the CAP.

The '97 CAP proposes 14 new control measures: 10 new stationary source measures (see Table 4), 2 new mobile source measures (see Table 5) and 2 new transportation control

measures (see Table 6). These were developed in response to state law that requires implementation of "all feasible measures."

The '97 CAP was prepared by the Air District in cooperation with the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC) pursuant to Health & Safety Code Section 40233. Section 40233 requires these three organizations to "develop and adopt a plan to control emissions from transportation sources which will achieve the emission reductions established" by the BAAQMD pursuant to Health & Safety Code Section 40233, subdivision (a), paragraph (1).

SOURCES OF AIR POLLUTION

There are literally millions of sources of air pollution in the Bay Area, ranging from industrial smoke stacks and motor vehicles to individual use of personal grooming products, household cleaners, and paints. The Earth, itself, and its plant and animal life are natural sources of air pollutants.

The source inventory summary in Table 1 and Figures 1 and 2 presents the current estimate of emissions of ozone precursors (ROG and NO_x) and particulate matter from human activities. In the Bay Area, human activity, or "anthropogenic" sources, are significantly greater than natural sources. The data presented in Table 1 are for 1990, the defined base year for state air quality planning, and for selected future years.

Table 1 shows inventory estimates for 1997 and projections for the years 2000 and 2003. The projections are based on expected growth rates in population, employment, industrial/commercial activity, travel, and energy use under control measures adopted as of December 1996. They do not include the control measures proposed in the '97 CAP.

Some sources of air pollution are measured directly, but most are estimated, based on source characteristics, throughput rates, partial sampling, and scientific or engineering calculations. Appendix G and the Air District's Inventory Methodology provide more details on the inventory process and its results.

Motor vehicle emission calculations include consideration of the fleet mix (vehicle type, model year, and accumulated mileage), miles traveled, ambient temperatures, vehicle speeds, and vehicle emission factors, as developed from comprehensive ARB testing programs. The Air District also receives vehicle registration data from the Department of Motor Vehicles. Some of these variables change from year to year, and the projections are based upon expected changes.

There is a good deal of evidence and expert opinion that indicate that real-world motor vehicle emissions may be significantly higher than the current inventory estimates derived from California's emissions model "MVEI7G." Some claim that actual emissions may be as high

as two to three times the current estimates. A recent study by U.C. Berkeley and the Air District, *A Fuel-Based Motor Vehicle Emission Inventory for the San Francisco Bay Area*, indicates that actual on-road motor vehicle ROG emissions are approximately 60% higher than the current estimates shown in the 1997 CAP.

To address this and other uncertainty issues associated with the inventory, a 1996 amendment to the CCAA (Sec. 39607.3) requires that "the state board shall, not later than January 1, 1998, and triennially thereafter, approve, following a public hearing, an update to the emission inventory...". It states later that "The Legislature hereby finds and declares that it is in the interests of the state that air quality plans be based on accurate emissions inventories. Inaccurate inventories that do not reflect the actual emissions into the air can lead to misdirected air quality control measures, resulting in delayed attainment of standards and unnecessary and significant costs."

As a result, ARB staff have been studying this issue and have held a number of workshops. They are reviewing available data and modifying test methods in an effort to improve the accuracy of the mobile source inventory. The next formal update of the MVEI has not yet been scheduled.

Table 1
Bay Area Baseline* Emission Inventory Projections : 1990 - 2003
Planning Inventory** (Tons/Day)

Source Category	Reactive Organic [1]					Oxides of Nitrogen [2]					Particulates (PM-10) [3,4]				
	1990	1994	1997	2000	2003	1990	1994	1997	2000	2003	1990	1994	1997	2000	2003
Industrial/Commercial Processes/Facilities															
Petroleum Refining Facilities	19	17	16	14	14	12	9	9	9	10	1	1	1	1	1
Chemical Manufacturing Facilities	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1
Other Industrial/Commercial Processes/Facilities	18	15	15	14	13	1	1	1	2	2	21	21	22	23	24
Petroleum Product/Solvent Evaporation															
Petroleum Refinery Evaporation	10	10	10	10	10	---	---	---	---	---	---	---	---	---	---
Fuels Distribution	13	12	11	12	12	---	---	---	---	---	---	---	---	---	---
Other Organic Compound Evaporation	105	95	86	86	88	---	---	---	---	---	---	---	---	---	---
Combustion - Stationary Sources															
Fuel Combustion	4	5	5	5	5	119	136	117	85	67	40	41	42	42	43
Burning of Waste Material	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
ERC Banking (Current)	8	8	8	8	8	7	7	7	7	7	---	---	---	---	---
Sub Total (District Jurisdiction)	180	163	153	151	153	143	156	137	105	89	64	65	67	69	71
Combustion - Mobile Sources															
On-Road Motor Vehicles (ARB Jurisdiction)	372	281	211	173	134	408	347	295	255	210	13	9	8	7	6
Off-Highway Mobile Sources (ARB/Federal Jur.)	59	61	59	58	58	141	141	149	153	158	6	6	6	6	6
Aircraft (Federal Jurisdiction)	17	17	14	15	15	16	18	16	16	17	5	4	3	3	3
Consumer Solvents and Other Sources	58	53	53	52	53	0	0	0	0	0	113	103	122	133	139
Grand Total	**687**	**576**	**492**	**449**	**413**	**708**	**662**	**598**	**530**	**474**	**200**	**187**	**206**	**217**	**225**

* Inventory and projections assume implementation of all control measures adopted as of Dec. 31, 1996.

** Anthropogenic or man-made emissions do not include 300 tpd of reactive organic emissions from natural sources.
Entries are rounded to nearest whole number, totals may not equal to sums of column entries.

1 Photochemically reactive organic compounds, excludes methane and other non-reactives, for summer operating day.

2 Oxides of nitrogen (nitric oxide and/or nitrogen dioxide), NOx as NO2, for summer operating day.

3 Suspended particulate matter emissions for winter operating day.

4 PM10 emissions from Other Sources include entrained road dust, construction and farming operations and wind blown dust.

FIGURE 1
1997 Emissions: Ozone Precursors-Reactive Organic Gases(ROG)
(492 tons/day - Summer)

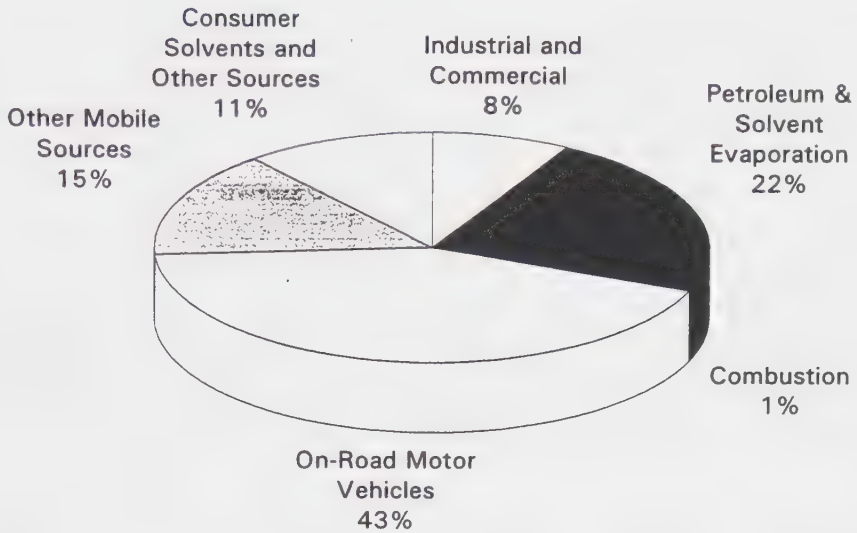
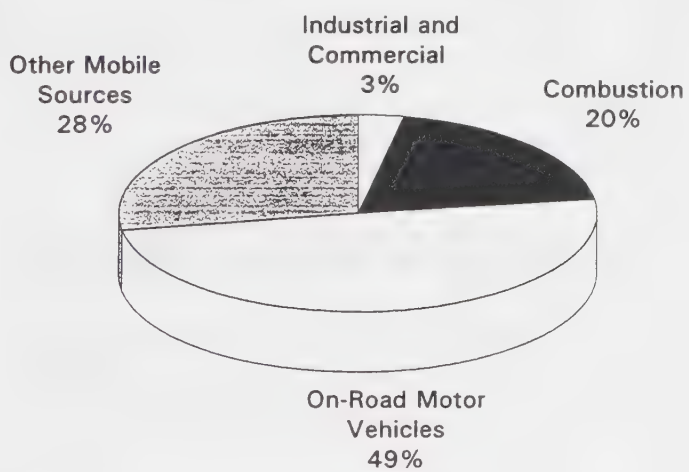


FIGURE 2
1997 Emissions: Ozone Precursors-Oxides of Nitrogen (NOx)
(598 tons/day - Summer)



OZONE TRENDS

The California Clean Air Act requires that each triennial plan revision include an assessment of changes in ambient concentrations of nonattainment pollutants. In the period since the passage of the California Clean Air Act, the Bay Area has continued to experience reductions in peak ozone levels.

Peak ozone concentrations have diminished one percent per year, on average, since the 1986-88 base period. This improvement is due to reductions in emissions of ozone precursors from stationary and mobile sources. The reductions are widespread, although some areas show greater improvements than others. The South Bay region appears to have shown the greatest improvement, while the eastern parts of the Bay Area have shown the least.

In 1995 and 1996, however, many of the Air District's monitoring sites reached ozone concentrations not seen since the 1980s. The Bay Area recorded 11 excesses of the national standard and 28 excesses of the state standard in 1995, and 8 excesses of the national standard and 34 excesses of the state standard in 1996. About half of the high pollution levels can be explained by meteorology; the summers of 1995 and 1996 both had an unusual number of days with weather patterns particularly conducive to high ozone. The greatest increases in ozone levels have occurred in the eastern portion of the Bay Area, an area of high growth and increasing traffic congestion. Thus far in 1997, the ozone season is one of the cleanest on record; no excesses of the national ozone standard have been recorded and only two excesses of the state standard have been recorded.

Section 40924 requires that population exposure to ozone be examined every three years. Population exposure to ozone has been reduced by 43 percent, as a weighted average for the region, since 1986, a much larger rate of decrease than the rate of decrease in peak ozone concentrations. This is because most ozone exceedances in the Bay Area are only marginally above the national one-hour ozone standard. A small reduction in peak ozone levels of, for example, 10 percent can reduce the number of hours exceeding the ozone standard by 40 percent or 50 percent. In other words, a small reduction in peak ozone levels eliminates many hours with ozone concentrations at unhealthy levels above the standard. For additional information, see Appendix C — "Air Quality Improvement: 1986-1996."

PARTICULATE MATTER TRENDS

Particulate matter (PM) has been implicated in a wide range of health effects from asthma attacks and chronic respiratory disease to deaths. The Bay Area has met national PM_{10} standards since 1991, although the region may not meet the new national $PM_{2.5}$ standards.[6] The Bay Area does

[6] The number "10" or "2.5" refers to the particle size, expressed in microns. A micron is one millionth of a meter. The U.S. EPA set new national ambient air quality standards for $PM_{2.5}$ in 1997.

not meet California PM_{10} standards, which are much stricter than the national standards. However, the California Clean Air Act does not require a plan to attain the state PM_{10} standard as it does for ozone.

The Bay Area experiences its highest PM concentrations in the winter. Based on analysis of the chemical composition of airborne PM_{10}, the main sources are wood smoke, combustion of fossil fuels, and airborne dust entrained (propelled into the air) by motor vehicles and construction. Woodburning largely occurs in winter, representing about a third of total PM_{10} emissions. And although fossil fuels are burned year-round, cooler winter temperatures convert much more of the NO_x produced into particulate ammonium nitrate, representing another third of PM_{10} emissions. Finally, the lower levels of solar radiation in the winter lead to stronger temperature inversions that are conducive to the buildup of particulates.

The Bay Area has not seen strong or consistent changes in PM_{10} levels during the last 15 years. Although the last few years have seen historically low PM_{10} levels, this appears largely due to greater winter storm activity than in the early 1990s. Moreover, the lack of clear trends is not surprising considering the sources. There is no indication that woodburning rates have changed in recent years and NO_x emissions have dropped only modestly. Although less PM is emitted from tailpipes, more PM is being entrained by motor vehicle tires as the total number of miles driven in the Bay Area increases.

LEGAL REQUIREMENTS

The California Clean Air Act of 1988, as amended, expanded the scope and accelerated the pace of air quality management efforts in California. The basic intent of the Act is to establish a planning process that will result in attainment of the state health-based ambient air quality standards by the earliest practicable date. If possible, Air District plans should achieve a reduction in districtwide emissions of 5 percent per year for ozone precursors (California Health and Safety Code Section 40914).[7] As an alternative strategy, the adoption of all feasible measures on an expeditious schedule is acceptable, even if an air district is unable to achieve a 5 percent annual reduction (Sec. 40914, paragraph (b)(2)).

California classifies ozone nonattainment areas based on their "expected peak day concentration," which is an ozone reading that the region should not exceed more than once per year, on average, excluding exceptional or extreme readings. Legal requirements vary according to the severity of a region's ozone problem. The Bay Area is subject to CCAA requirements for "serious" areas. (Secs. 40921.5, paragraph (a)(2), 40919). The requirements and the Bay Area's actions include the following:

[7] All references to Section numbers are for the California Health and Safety Code, unless otherwise noted.

- **Emissions inventory system** (Sec. 40918, paragraph (a)(5)). *The Air District maintains an emissions inventory system, and receives annual emissions statements from permitted point sources.*

- **A regional public education program** (Sec. 40918, paragraph (a)(6)). *The Air District's "Spare the Air" public education program is aimed at curbing emissions from motor vehicles and other ROG-emitting sources on days when the ozone forecast is a Pollutants Standards Index (PSI) of 92 (11 parts per hundred million, or "pphm" — approaching the federal standard) or above (summer), and "Spare the Air Tonight" is aimed at reducing woodburning during the winter. Other ongoing activities include a Speaker's Bureau, Smoking Vehicle Program and grassroots resource teams located throughout the Bay Area.*

- **Best available retrofit control technology (BARCT) on all existing permitted stationary sources** (Sec. 40919, paragraph (a)(3)). *Air District rules, in some cases supplemented by permit conditions, incorporate BARCT, and cover all permitted stationary sources within the Air District. Air District staff perform an assessment of BARCT requirements when proposing new rules or rule amendments or when issuing or updating stationary source permits.*

- **A permitting program** designed to achieve no net increase in emissions from permitted sources with a potential to emit greater than 15 tons per year of a nonattainment pollutant and to require the use of best available control technology (BACT) on new and modified sources with a potential to emit greater than 10 pounds per day (Sec. 40919, paragraph (a)(2)). *BAAQMD Regulation 2, Rule 2 — New Source Review — meets these requirements.*

- **Measures to achieve a significant number of low-emission vehicles in motor vehicle fleets** (Sec. 40919, paragraph (a)(4)). *Proposed mobile source control measure M4 - Low Emission Vehicle Fleet Operations — addresses motor vehicle fleet emissions. TCMs 3 and 10 include clean fuel buses and TCM 17 includes Clean Air Vehicle demonstration projects. The Air District's Transportation Fund for Clean Air provides funding for these TCMs.*

- **Indirect source and area source programs** (Sec. 40918, paragraph (a)(5)). *TCM 15 — Local Clean Air Plans, Policies and Programs — addresses the indirect source requirement. Management of area source emissions is addressed through existing Air District regulations, various proposed control measures in Table 4, and TCM 16 — Intermittent Control Measure / Public Education.*

- **Transportation control measures** to substantially reduce the rate of increase in passenger vehicle trips and miles traveled per trip (Sec. 40918, paragraph (a)(3)). *It is expected that VMT and trips will grow at approximately 1.4 and 1.8 percent per year, respectively, a significant reduction from the previous rate of VMT growth and a slight increase in the previous rate of vehicle trip growth.*

- **An assessment of cost-effectiveness of proposed control measures** (Sec. 40922). *See "Cost-Effectiveness Estimates" section of this document.*

- **Transport mitigation requirements** (Sec. 39610, subdivision (b)). *ARB's transport mitigation policy required that by January 1, 1994, the Air District adopt rules for BARCT on source categories that comprise 75 percent of the 1987 ROG and NO_x inventories for permitted stationary sources. Transport mitigation requirements were intended to accelerate BARCT implementation in upwind source areas of defined transport couples.[8] The Air District complied with the 75 percent coverage requirements by 1994. See Appendix C of the 1994 Clean Air Plan for additional information. Now all permitted stationary sources in the Air District are subject to BARCT.*

Periodic legal requirements include:

- **An annual regulatory schedule** (Sec. 40923). *The Air District produces a regulatory schedule each December, listing regulatory measures scheduled or tentatively scheduled for consideration during the following year.*
- **An annual progress report** on control measure implementation and, every third year, an assessment of the overall effectiveness of the program (Sec. 40924). *The Air District has submitted annual progress reports to ARB each year since 1992. The first triennial assessment of Plan effectiveness was submitted as part of the '94 CAP. The '97 CAP also includes a triennial assessment, which is comprised of the following sections of this document:*

  * *Ozone Trends, including Appendix C*

  * *Adopted Control Measures*

  * *Meeting CCAA Performance Standards, including Appendix B*

- **A review and update of the Plan every three years** to correct for deficiencies and to incorporate new data (Sec. 40925). *This Plan incorporates new data and necessary changes to the '94 CAP but does not change the overall environmental impacts associated with full plan implementation that were evaluated in the 1991 CAP Environmental Impact Report.*

ADOPTED CONTROL MEASURES

Of the 49 stationary and mobile source control measures included as part of the '91 CAP, 20 measures have been adopted, three stationary source measures have been deleted, one stationary source control measure has been merged with another control measure, and 25 measures are scheduled for future action. In addition, 14 measures have been added. Deletions occur when

---

[8] ARB is required by state law to evaluate intrastate transport and to suggest mitigation for such transport. According to ARB, the Bay Area is responsible for *overwhelming* transport to three locations in adjacent air basins. This assessment is based on specific days with certain meteorological conditions. The three locations are Vacaville (in the greater Sacramento air basin), Crows Landing (in the San Joaquin Valley) and Pinnacles National Monument. The Bay Area does not cause violations of the national ozone standard in these locations.

subsequent investigation shows the proposals to be technically infeasible or prohibitively expensive for the emission reductions gained. The '97 CAP now contains 39 stationary and mobile source control measures.

Of the 23 transportation measures in the '91 CAP, 17 were at least partially implemented by 1994. Transportation control measure implementation is ongoing, and the TCMs were restructured into 19 TCMs for the '94 CAP and 20 TCMs for the '97 CAP (two new TCMs were added to the '97 CAP and two '94 CAP TCMs were combined into one).

Two '94 CAP control measures have not been adopted and are proposed for deletion. These are:

Control Measure		Reason for Deletion
B1	CONTROL OF EMISSIONS FROM RAILCAR LOADING	Insufficient emission reduction potential to warrant consideration. (Accidental release potential addressed in the Air District's Risk Management Policy.)
B7	CONTROL OF EMISSIONS FROM PROPANE HANDLING	Not cost effective

The tables below summarize the control measures from the '94 CAP that have been adopted or implemented. Table 2 summarizes stationary, intermittent and mobile source control measures that were adopted between 1991 and 1997, and provides an estimate of the range of emission reductions expected from these control measures. Two measures shown in Table 2, B4 and M5, have been adopted since 1994. Four additional measures are scheduled for adoption in the fourth quarter of 1997. Although the *number* of measures adopted is lower than for 1991-1994, substantial progress in the Air District's air quality control program is still being achieved. Many of the control measures adopted in the earlier period (1991-1994) are now being implemented, and will achieve significant emissions reductions. Table 3 illustrates '94 CAP Transportation Control Measures that were implemented by 1997.

TABLE 2
ADOPTED STATIONARY AND
MOBILE SOURCE MEASURES: 1991-1997

CONTROL MEASURE	EMISSION REDUCTION AFTER IMPLEMENTATION (tons per day)		AIR DISTRICT REGULATION
	ROG	NO_x	
A. SURFACE COATING AND SOLVENT USE			
A3 IMPROVED AEROSPACE COATINGS RULE (a) Set transfer efficiency standards *Part (b) has not been completed. It remains part of the 1997 CAP (see Table 4).*	0.02-0.03		8-29
A4 IMPROVED WOOD FURNITURE AND CABINET COATINGS RULE (a) Establish ROG limits for coatings (b) Eliminate small user exemption	5.8-6.5		8-32
A5 IMPROVED SURFACE COATING OF MISCELLANEOUS METAL PARTS AND PRODUCTS RULE (a) Set transfer efficiency standards *Part (b) has not been completed. It remains part of the 1997 CAP (see Table 4).*	0.06-0.13		8-19
A6 IMPROVED SURFACE COATING OF PLASTIC PARTS AND PRODUCTS RULE (a) Set transfer efficiency standards *Part (b) has not been completed. It remains part of the 1997 CAP (see Table 4).*	negligible		8-31
*A7 IMPROVED CAN AND COIL COATING RULE (a) Lower ROG limits for some coatings	.25		8-11
A10 IMPROVED GENERAL SOLVENT AND SURFACE COATING RULE (b) Modify mass emission limits	unknown		8-4
A11 FURTHER REDUCTION OF EMISSIONS FROM ADHESIVES USE (a) Establish ROG limits for adhesives	6		8-51
A12 ELIMINATION OF COATINGS RULES / ALTERNATIVE EMISSION REDUCTION PLANS (a) Eliminate or modify AERP provisions in Reg. 8 rules	unknown		8-12, 8-13, 8-14, 8-19, 8-23, 8-29, 8-30, 8-31, 8-32, 8-38
A13 IMPROVED GRAPHIC ARTS PRINTING OPERATIONS RULE (a) Lower ROG limits for fountain solutions (c) Lower ROG limits for inks *Parts (b) and (d) were deleted from the CAP in 1994.*	1.3		8-20

TABLE 2 (Cont'd)

ADOPTED STATIONARY AND MOBILE SOURCE MEASURES: 1991-1997

CONTROL MEASURE	EMISSION REDUCTION AFTER IMPLEMENTATION (tons per day)		AIR DISTRICT REGULATION
	ROG	NO_x	
A14 IMPROVED COATINGS AND INK MANUFACTURING RULE (b) Eliminate the small manufacturer exemption (c) Require reduced emissions from vat cleaning *Part (a) has not been completed. It remains part of the 1997 CAP (see Table 4).*	0.5-0.7		8-35
*A18 SUBSTITUTE SOLVENTS USED IN SURFACE PREPARATION AND CLEANUP OF COATINGS (b) Set ROG/volatility limits for cleanup solvents *Part (a) has not been completed. It remains part of the 1997 CAP (see Table 4).*	3.8		8-16
B. FUELS/ORGANIC LIQUIDS STORAGE AND DISTRIBUTION			
B2 IMPROVED STORAGE OF ORGANIC LIQUIDS RULE (c) Require better tank seals/more frequent inspections (g) Require emissions to be reduced during tank cleaning *Other parts of this control measure remain part of the 1997 CAP (see Table 4), except for part (d), tank color requirements, which was dropped from the 1991 CAP.*	2 - 3		8-5
B3 IMPROVED ORGANIC CHEMICAL TERMINALS & BULK PLANTS RULE (a) Reduce emission standard for non-gasoline bulk terminals and plants	0.01		8-6
*B4 FURTHER EMISSION REDUCTIONS FROM GASOLINE DELIVERY VEHICLES	0.5 - 0.7		CARB standards, test methods
C. REFINERY AND CHEMICAL PLANT PROCESSES			
C2 IMPROVED PUMP AND COMPRESSOR SEALS AT REFINERIES AND CHEMICAL PLANTS RULE (a) Require leakless seals (b) Adopt a more stringent leak definition	6.5		8-18
*C3 IMPROVED VALVES AND FLANGES AT REFINERIES AND CHEMICAL PLANTS RULE (a) Require leakless valves (b) Improve inspection and maintenance requirements (c) Adopt a more stringent leak definition *A new element of part (b), Control of Fittings, has been added to the 1997 CAP (see Table 4).*	included in C2 above 1.5		8-22, 8-25
D. COMBUSTION OF FUELS			
D1 REDUCTION OF EMISSIONS FROM NON-UTILITY RECIPROCATING ENGINES (a) Adopt NOx reductions similar to existing SCAQMD Rule 1110.2		8.3	9-8

TABLE 2 (Cont'd)
ADOPTED STATIONARY AND MOBILE SOURCE MEASURES: 1991-1997

CONTROL MEASURE	EMISSION REDUCTION AFTER IMPLEMENTATION (tons per day)		AIR DISTRICT REGULATION OR PROGRAM
	ROG	NO_x	
D2 EMISSION REDUCTION OF EMISSIONS FROM STATIONARY GAS TURBINES (a) Adopt NOx reductions similar to existing SCAQMD Rule 1134		7	9-9
D3 REDUCTION OF EMISSIONS FROM ELECTRIC POWER GENERATING BOILERS (a) Adopt NOx reductions based on add-on flue gas treatment		10-25	9-11
D4 REDUCTION OF EMISSIONS FROM BOILERS, STEAM GENERATORS, AND PROCESS HEATERS (a) Adopt NOx reductions similar to existing SCAQMD Rule 1146 (1) Large units (100 MMBTU/hr or larger) (2) Smaller units (less than 100 MMBTU/hr)		21	9-10, 9-7
D5 REDUCTION OF EMISSIONS FROM CEMENT PLANT KILNS (a) Adopt NOx reductions similar to existing SCAQMD Rule 1112		0	Source-specific SIP submittal
D6 REDUCTION OF EMISSIONS FROM GLASS MANUFACTURING PLANT MELTING FURNACES (a) Adopt NOx reductions similar to existing SCAQMD Rule 1117		1.2	9-12
D7 REDUCTION OF EMISSIONS FROM RESIDENTIAL WATER HEATING (a) Adopt NOx standards for new residential and commercial water heaters		3.3	9-6
F. OTHER STATIONARY SOURCE MEASURES			
F1 IMPROVED NEW SOURCE REVIEW RULE	unknown	unknown	2-2
F3 PROMOTION OF ENERGY EFFICIENCY (a) Establish a goal of increasing energy efficiency	unknown	unknown	Air District workshops and energy efficiency handbook
F4 ENHANCED ENFORCEMENT OF EXISTING AIR DISTRICT REGULATIONS (a) Implement a program to increase compliance with Air District regulations	unknown	unknown	Various Regulation 8 rules monitoring requirements
*F5 EMISSION REDUCTION CREDITS TO MITIGATE EMISSIONS FROM VIOLATIONS AND VARIANCES	unknown	unknown	
G. INTERMITTENT MEASURES			
G1 CITIZEN POSTPONEMENT OF DISCRETIONARY ACTIVITIES (a) Encourage postponement of certain activities during forecast ozone excess days	unknown	unknown	Program initiated in 1991
G2 INDUSTRIAL POSTPONEMENT OF ACTIVITIES DURING FORECAST OZONE EXCESS DAYS (a) Implement a program directed at postponement of certain industrial activities during forecast ozone excess days (1) Voluntary	unknown	unknown	Program initiated in 1992

TABLE 2 (Cont'd)
ADOPTED STATIONARY AND MOBILE SOURCE MEASURES: 1991-1997

CONTROL MEASURE	EMISSION REDUCTION AFTER IMPLEMENTATION (tons per day)		AIR DISTRICT REGULATION OR PROGRAM
	ROG	NO_x	
H. AIR DISTRICT PROGRAMS AFFECTING MOTOR VEHICLES			
H1 SMOKING VEHICLE PROGRAM (a) Implement a citizen complaint program for smoking vehicles	1.4	0 (5.0 PM_{10})	Program initiated in 1992.
M. MOBILE SOURCE MEASURES			
M1 MOBILE SOURCE EMISSION REDUCTION CREDIT PROGRAM (a) Vehicle buy-back program (b) Zero emission fleet vehicles (c) Low emission vehicle retrofits	unknown	unknown	Manual of Procedures Chapter VIII
*M5 PUBLICLY FUNDED VEHICLE BUY-BACK PROGRAM	0.31	0.08	Program initiated in 1996.
TOTAL EMISSIONS REDUCED	**30 - 32**	**51 - 66**	

* Adopted or will be adopted, 1994-1997

TABLE 3
IMPLEMENTED TRANSPORTATION CONTROL MEASURES: 1994-1997

	TONS/DAY EMISSION REDUCTION	
TRANSPORTATION CONTROL MEASURE	ROG	NO_x
TCMs 1 & 2: Employer Assistance / Employer Based Trip Reduction (EBTR)		
EBTR Rule implemented but subsequently rescinded by state law—no emission reductions credited.		
Voluntary employer trip reduction programs and ridesharing/trip reduction projects funded by Transportation Fund for Clean Air.	.6	.7
TCM 3: Improve Areawide Transit Service		
CalTrain service increased from 60 to 66 trains per day	.26	.26
Clean-fuel bus projects funded by Transportation Fund for Clean Air	.01	.02
TCM 4: Expedite & Expand Regional Rail Agreement		
BART extended from Daly City to Colma, from Concord to West Pittsburg, and from BayFair to Dublin	.07	.07
TCM 5: Improve Access to Rail and Ferries		
Shuttle projects funded by Transportation Fund for Clean Air	.43	.36
TCM 6: Improve Interregional Rail Service		
Capitol Service expanded between Roseville and San Jose	unknown	unknown

TABLE 3 (Cont'd)
IMPLEMENTED TRANSPORTATION CONTROL MEASURES: 1994-1997

TRANSPORTATION CONTROL MEASURE	TONS/DAY EMISSION REDUCTION	
	ROG	NO_x
TCM 7: Improve Ferry Service Second Vallejo ferry added	.01	.01
TCM 8: Construct Carpool / Express Bus Lanes on Freeways Additional HOV lanes (30 lane miles) opened	unknown	unknown
TCM 9: Improve Bicycle Access and Facilities Bicycle projects funded by Transportation Fund for Clean Air	.09	.08
TCM 10: Youth Transportation Clean-Fuel school bus projects funded by Transportation Fun for Clean Air	.02	.05
TCM 11: Install Freeway Traffic Operations System (TOS) Freeway service patrols expanded by 47 miles to 235 miles	unknown	unknown
TCM 12: Improve Arterial Traffic Management Traffic signalization projects funded by Transportation Fund for Clean Air	.48	.13
TCM 13: Transit Use Incentives Transit incentive projects funded by Transportation Fund for Clean Air	.03	.04
TCM 14: Improve Rideshare/Vanpool Services and Incentives Regional rideshare contract administered by MTC; local trip reduction efforts continued	.2	.2
TCM 15: Local Clean Air Plans, Policies & Programs The Air District developed a guidebook for local plans and programs to improve air quality MTC adopted a land use policy	unknown	unknown
TCM 16: Intermittent Control Measure / Public Education The Air District maintained the *Spare the Air* and *Employer Spare the Air* programs, enhanced by BayCAP.	0.35-1.25 (only on STA days)	0.07-0.99 (only on STA days)
TCM 17: Conduct Demonstration Projects Projects funded by Transportation Fund for Clean Air: clean a vehicles and infrastructure, and telecommuting assistance. Federal funding rescinded for Bay Bridge Congestion Pricing Demonstration Project	.03	.06
TOTAL DAILY TONS REDUCED	**2.2**	**2.0**

STRATEGY

Reducing Population Exposure

The overall goal of this planning process is to reduce the health impacts of ozone in ambient air. Sec. 40920, paragraph (c) requires areas with *severe* air pollution (the Bay Area is classified as *serious*) to adopt "control measures sufficient to reduce overall population exposure to ambient pollutant levels in excess of the state standard by 40 percent by December 31, 1997." Even though the requirement is not applicable to the Bay Area, this goal has been met. Population exposure to ozone has been reduced by 43 percent since the 1986-88 base period. (For more detail, see Appendix C — "Air Quality Improvement: 1986-1996").

Implementing "All Feasible Measures"

The strategy for this air quality plan is to implement all feasible measures on an expeditious schedule in order to reduce pollutant emissions as quickly as possible. Areas that cannot achieve the 5 percent per year pollutant reduction target specified in the California Clean Air Act can comply with an alternative requirement — California Health and Safety Code, Section 40914(b)(2), which requires that a plan include every feasible control measure and an expeditious adoption schedule of those feasible control measures.

Neither "feasible" nor "expeditious" is expressly defined in the CCAA. However, Sec. 40406 alludes to what may be considered feasible when it defines best available retrofit control technology (BARCT) that areas with serious air pollution such as the Bay Area must implement for all existing stationary sources. BARCT is defined as "an emission limitation that is based on the maximum degree of reduction achievable, taking into account environmental, energy and economic impacts by each class or category of source." Feasible measures are those control measures which are: 1) reasonable and necessary for the San Francisco Bay Area; 2) capable of being implemented in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors; and 3) approved or approvable by the California Air Resources Board, based upon state law and ARB policies. An expeditious adoption schedule has been defined in previous Clean Air Plans as the adoption of eight plan control measures per year. Although that number was exceeded in the 1991-1994 time period, since 1994 that goal could not be achieved. The control measures that were most easily adopted and implemented were set for consideration at the earliest practicable date (e.g., 1991-1994). Subsequent control measures have proved more costly, less technically feasible, and less acceptable to the public or industry. Some have required a more lengthy rule development process than earlier measures. The schedule set forth in Table 10 is the most expeditious possible.

In addition to control measures in the plan, Air District staff may also periodically review control measures adopted and implemented by other California air districts in order to identify additional control measures that may be applicable in the Bay Area.

The strategy also includes these related objectives:

- Implementation of a no net increase permit system for new and modified stationary sources with a potential to emit greater than 15 tons per year of an ozone precursor.
- Adoption of rules requiring best available retrofit control technology (BARCT) on permitted sources representing 75 percent of the 1987 ozone precursor inventory.

These actions were taken to satisfy ARB regulations for mitigation of air pollutant transport to other air districts.

Why Control Both ROG and NO_x?

Reactive organic gases (ROG) and oxides of nitrogen (NO_x) react in the presence of ultraviolet light to form ozone. The chemistry of these reactions is extremely complex, since hundreds of different reactive organic gases may react with NO_x to form ozone while, at the same time, other reactions remove this ozone from the atmosphere. Because of this complexity, computer models are often used to predict the effects of ROG and NO_x emissions on ozone formation.

Under Section 185B of the federal Clean Air Act, the National Academy of Sciences was charged with studying the role of ROG and NO_x emissions in ozone formation. Its study, called *Rethinking the Ozone Problem in Urban and Regional Air Pollution*, was conducted by the National Research Council and published in 1991. A central finding of the study was that the relative effectiveness of ROG and NO_x controls for reducing ozone depends on the ambient ROG to NO_x ratios within an air basin. At ambient ROG to NO_x ratios of about 10 or less, ROG control is more effective, and NO_x controls may be counterproductive. At ROG to NO_x ratios of 20 or more, NO_x control is generally more effective.

The ratio of ROG to NO_x varies over time and location within an air basin, and between air basins with different source mixes. Based on 1992-93 summertime morning samples, the Bay Area ratio of ROG to NO_x is less than 10. As a result, the most effective strategy for reducing Bay Area ozone concentrations is to limit ROG emissions. Reductions in NO_x are probably ineffective, or even counterproductive, in lowering Bay Area ozone levels. These conclusions are supported by results from photochemical grid models employed by the Air District to assess the effectiveness of various emission control strategies.

Nevertheless, state law requires that the Air District implement all feasible measures to reduce both ROG and NO_x. The Air District is also required to mitigate the transport of NO_x downwind to other air basins. The transport of Bay Area NO_x may increase ozone levels in neighboring, downwind air basins. Reducing NO_x is also beneficial for reducing particulate emissions, since NO_x generated by combustion is converted in the atmosphere to nitrate aerosols, a component of PM_{10}.

Contingency Measures

Given a strategy to implement all feasible measures on an expeditious adoption schedule, the treatment of contingency measures must be considered. Sec. 40915 of the Act requires that

contingency measures be adopted if ARB finds that an air district fails to achieve or maintain adequate progress toward its reduction goals.

In the past, some California air districts have maintained a separate list of contingency measures to be adopted if one or more of the core control measures in their plans did not produce the expected results. These contingency measures are usually more costly or more difficult to implement, and therefore are typically not included in listings of core control measures when plans are adopted. In the current planning process, it does not make sense to identify contingency *measures* that are not deemed feasible at the time of plan adoption. Therefore, the Bay Area has identified a contingency *procedure* for the '97 CAP:

- The Air District and other implementing (i.e., transportation) agencies will strive to adopt and implement feasible control measures on the schedules set forth in this Plan and subsequent annual regulatory schedules.
- When a Plan control measure cannot be adopted or implemented, the Air District will accelerate, to the extent possible, the rule adoption and implementation process for the other subsequent control measures.
- In the annual progress reports required under Section 40924, the Air District will report on the rule adoption process, including any delays or failures, and describe efforts to accelerate development and adoption of subsequent feasible control measures.
- If additional control measures not currently in this Plan are later identified as feasible, with significant emission reductions, and greater cost-effectiveness than some control measures already in the Plan, the Air District will incorporate those control measures into the annual regulatory schedule with an appropriate priority, given their complexity and emission reduction potential.

PROPOSED CONTROL MEASURES

This section summarizes the proposed control measures in the '97 CAP. The regulatory schedule for the '97 CAP is provided in Table 10, and detailed descriptions of all the control measures are provided in Appendices E and F.

Stationary Source Control Measures

Under the California Clean Air Act (CCAA), local air districts are given primary responsibility for controlling emissions from all sources other than motor vehicles (Sec. 40000) and certain other sources that are regulated exclusively by the Air Resources Board or EPA (such as construction equipment, boats, aircraft, lawn and garden equipment, and locomotives - see pages 53-54). As a result, the primary role of local air districts is to control emissions from stationary sources.

Stationary sources include those point sources for which an air permit is required - potentially "any article, machine, equipment, or other contrivance which may cause the issuance of air contaminants" (Sec. 42300) - as well as area sources. Area sources include smaller sources, such as residential heating equipment and use of paint and consumer products, that do not require a permit but, when taken together, may produce significant emissions. However, air districts lack authority to regulate one major area source, consumer product use, because the CCAA grants exclusive authority over consumer products as areawide sources to the Air Resources Board (Sec. 41712).

Stationary Source Emissions

Stationary source emissions that are the precursors to ozone formation come from almost any process that uses organic fuel or solvent, and from the combustion of fuel. The Air District's stationary source control program has, since 1980, reduced emissions from stationary sources from 310 tons of reactive organic gases per day and 183 tons of oxides of nitrogen per day to 1997 levels of 153 tons ROG (a 51 percent reduction) and 137 tons NO_x (a 25 percent reduction). Nevertheless, the percentage contribution of stationary sources to the Air District's inventory has remained about the same, approximately 31 percent of ROG emissions and approximately 23 percent of NO_x emissions (see Table 1). The following table illustrates stationary source emissions, broken down by type of operation or process.

1997 Stationary Source Emissions: Ozone Precursors (summer average)

Source	ROG (tons/day)	NO_x (tons/day)
Industrial/Commercial Processes		
Refineries	16	9
Landfills	4	
Chemical manufacturing	2	2
Soil aeration	4	
Bakeries	1	
Cooking	1	
Wineries	1	
Misc. sources	4	
Subtotal, industrial/commercial	**33**	**12**
Fuel Storage and Distribution		
Refinery loading and storage	9	
Gas stations	6	
Aircraft fueling	2	
Bulk plants	1	
Misc. sources	3	
Subtotal, fuel storage/distribution	**21**	
Organic Compounds Evaporation		
Industrial/commercial coating	32	
Structures coating	22	
Adhesives and sealants	12	
Degreasing	6	
Printing	8	
Misc. other sources	6	
Subtotal, organics evaporation	**86**	
Fuel Combustion		
Domestic	2	11
Cogeneration		9
Refineries, external		22
Power plants		12
IC engines		8
Misc. other sources	3	55
Subtotal, fuel combustion	**5**	**117**
Banked for Future Use	**8**	7
Total, all stationary source emissions	**153**	**137**

The stationary source inventory is further detailed in Appendix G.

Regulation of Stationary Sources

The Air District has historically reduced stationary source emissions through "command and control" regulations. Such regulations prohibit sources from emitting more than a certain amount of a specified pollutant for a certain unit of measure. For example, coatings may contain no more than a certain amount of grams of volatile organic compounds per liter of coating; a combustion source may emit no more than a certain concentration of oxides of nitrogen measured in parts per million; or a solvent cleaner may not operate unless it has certain components designed to limit emissions. This methodology reduces emissions for any given source category, but does not impose a cap on total emissions from that source category. The "command and control" methodology works in consort with the Air District's permitting and New Source Review programs, which limit increases in the emissions at each facility.

There are, however, other methods of limiting air pollution in addition to the "command and control" approach. The Air District has embarked on and is proposing in this plan several other approaches, including (1) programs that will limit emissions through *voluntary* programs, (2) control measures that may only become effective during the high ozone season, (3) incentive programs that relax some administrative requirements if emissions can be limited beyond the standards in a rule, and (4) promotion of educational materials that will lead the population to make choices that are less polluting, such as promoting energy efficiency. The effectiveness of these types of programs is less easily measured than command and control programs; however, the Air District believes strongly in providing flexibility that reduces the cost of compliance, provided air quality will not be compromised. The agency also promotes innovative programs that are likely to have air quality benefits.

The Air District intends to pursue command-and-control as well as voluntary, seasonal, incentive or educational control measures for stationary sources through this Clean Air Plan. These concepts may be blended together within a regulation or may be pursued outside of a regulatory structure.

Developing Stationary Source Control Measures

A comprehensive list of potential stationary source control measures was compiled from suggestions by Air District staff and other interested parties and from the literature and proposals of other jurisdictions. Where information was available, potential control measures were screened for total emission reduction potential, rate of reduction, cost-effectiveness, public acceptability, and enforceability. The control measures listed in Table 4, which include several new stationary source measures, constitute all feasible stationary source control measures for the Bay Area.

Existing Air District regulations, plus the stationary source proposals in the '97 CAP, cover all the applicable control measures on ARB's "List of Feasible Measures for Stationary Sources,"

dated March 1991. A few control measures on the ARB list are not included (such as kelp-processing) because no corresponding sources exist in the Bay Area.

Table 4 lists the stationary source control measures proposed for adoption. Included in the table are:

- Brief descriptions of proposed control measures
- Estimated cost-effectiveness
- Estimated potential emission reductions
- Projected implementation dates
- Ratings of technical feasibility, public acceptability, and enforceability
- Proposed adoption dates

The Air District will be the responsible implementing agency for all of the stationary source control measures, except A17 (Reduced Emissions from Household Solvent Disposal). Control measure A17 would be implemented by cities and counties.

Collectively, the proposed stationary source control measures are expected to reduce reactive organic gases by 21 tons per day by 2000, 25 tons per day by 2003 and 41 tons per day when all control measures are fully implemented. They are expected to reduce NO_x emissions by 1 ton per day in 2003 and 4.6 tons per day when fully implemented. Two control measures, D5 and E3, will be helpful in reducing PM_{10} emissions. It is expected that these two measures will reduce PM_{10} by 5.3 tons per day when fully implemented. More detailed information on the stationary source control measures is available in Appendix F (Volume III of the CAP).

Table 4
PROPOSED STATIONARY SOURCE CONTROL MEASURES

Proposed New Control Measure (not part of '94 CAP) or Measure Significantly Modified from '94 CAP Control Measure

(Unshaded) Control Measure Was Included in '94 CAP -- Schedule May Have Been Modified

# TITLE	Cost Effectivenes $/ton reduced	Minimum ROG E.R. Potential tons/day	Rate of Reduction imp. date	Feasibility of Technology A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
A. SURFACE COATING AND SOLVENT USE							
A1 IMPROVED ARCHITECTURAL AND INDUSTRIAL MAINTENANCE COATINGS RULE							
(a) Lower ROG limits for some specialty coatings	$2000	1.4	2003	D	B	B	2001 - 2003
(b) Eliminate small container exemption	$2000		9/98	D	B	B	1998
A3 IMPROVED AEROSPACE COATINGS RULE							
(b) Lower ROG limits for some specialty coatings	$2000	.06	1/99	D	A	B	1998
A5 IMPROVED SURFACE COATING OF MISCELLANEOUS METAL PARTS AND PRODUCTS RULE							
(b) Lower ROG limits for some specialty coatings	$2000	.59	1/99	D	A	B	1998
A6 IMPROVED SURFACE COATING OF PLASTIC PARTS AND PRODUCTS RULE							
(b) Lower ROG limits for some coatings	$2000	.27	1/99	D	A	B	1998
A8 IMPROVED MAGNET WIRE COATING OPERATIONS RULE							
(a) Modify or eliminate exemptions	$2000	.11	1/00	C	A	B	1999
A9 IMPROVED AUTOMOBILE ASSEMBLY COATING OPERATIONS RULE							
(a) Require further emissions reductions for some coating operations	$19000	.94	2003	B	A	A	2001 - 2003
(b) Lower ROG limits for some coatings	$2000		2003	D	A	B	2001 - 2003
A14 IMPROVED COATINGS AND INK MANUFACTURING RULE							
(a) Abate emissions from large mixing operations	$6000	.31	2003	B	A	C	2001 - 2003
A15 IMPROVED RESIN MANUFACTURING RULE							
(a) Abate pellet extrusion and final product packaging	unknown	unknown	2003	B	A	A	2001 - 2003
A16 IMPROVED SEMICONDUCTOR MANUFACTURING OPERATIONS RULE							
(a) Abate emissions from positive photoresist operations	$4000 (a-b)	.02	2000	A	A	A	1999
(b) Abate emissions from solvent cleaning performed with coating-type applicators			2000	A	A	A	1999
A17 REDUCED EMISSIONS FROM HOUSEHOLD SOLVENT DISPOSAL							
(a) Encourage cities and counties to implement programs for proper disposal of ROG-containing household wastes	unknown	.40	2000	B	B	D	2000

Table 4 (Cont.)
PROPOSED STATIONARY SOURCE CONTROL MEASURES

Proposed New Control Measure (not part of '94 CAP) or Measure Significantly Modified from '94 CAP Measure

(Unshaded) Measure Was Included in '94 CAP -- Schedule May Have Been Modified

#	TITLE	Cost Effectiveness $/ton reduced	Minimum ROG E.R. Potential tons/day	Rate of Reduction imp. date	Feasibility of Technology A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
A18	SUBSTITUTE SOLVENTS USED FOR SURFACE PREPARATION/ CLEANUP OF COATINGS							
	(a) Set ROG/volatility limits for surface preparation solvents	$1100	3.8	2000	B	A	C	1998
A19	ULTRA-LOW ROG COATINGS							
	(a) Set ROG limits for coatings based on Vernonia oil substitution and/or UV curable	unknown	15	2004+	D	B	A	2004+
A20	CONTROL OF EMISSIONS FROM PRODUCTS MANUFACTURED FROM POLYSTYRENE FOAM, POLYETHYLENE, AND POLYPROPYLENE	$2000	.04	7/98	A	A	A	1998
B.	**FUELS/ORGANIC LIQUIDS STORAGE AND DISTRIBUTION**							
B2	IMPROVED STORAGE OF ORGANIC LIQUIDS RULE							
	(a) Adopt more stringent standards for cone roof tanks	$2000 (a-l)	1.1	2000	B	A	A	1998
	(b) Lower or replace small tank exemption with a throughput exemption			1/99	B	A	A	1998
	(e) Require vapor recovery for certain tanks			1/99	B	A	A	1998
	(f) Require compliance-based floating roof tank vapor recovery retrofit			1/99	B	A	A	1998
	(h) Low emitting retrofits for slotted guide poles	$300	.50	2000	A	A	A	1998
	(i) Tank inerting requirements	$10000	.50	2000	B	A	A	1999
B5	LIMITATIONS ON MARINE VESSEL TANK PURGING							
	(a) Require reduction of ballasting and housekeeping emissions	$4200	2.3	7/98	B	A	C	1998
B6	REDUCED EMISSIONS FROM CLEANING UP ORGANIC LIQUIDS							
	(a) Require reduction of emissions from cleaning storage tanks, vessels, and ROG spills	$42000	unknown	2004+	A	A	C	2004+
B8	IMPROVED GASOLINE DISPENSING FACILITY RULE	$1000	3.0	2000	A	A	B	1999
C.	**REFINERY AND CHEMICAL PLANT PROCESSES**							
C1	IMPROVED PRESSURE RELIEF VALVES AT REFINERIES AND CHEMICAL PLANTS RULE							
	(a) Require venting to abatement devices and/or rupture disks with tell-tale indicators	$10000	.47	1/99	A	A	B	1998

Table 4 (Cont.)
PROPOSED STATIONARY SOURCE CONTROL MEASURES

Proposed New Control Measure (not part of '94 CAP) or Measure Significantly Modified from '94 CAP Control Measure
(Unshaded) Control Measure Was Already Included in '94 CAP -- Schedule May Have Been Modified

#	TITLE	Cost Effectiveness $/ton reduced	Minimum ROG E.R. Potential tons/day	Rate of Reduction imp. date	Feasibility of Technology A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
C4	IMPROVED PROCESS VESSEL DEPRESSURIZATION RULE							
	(a) Improve depressurization standards	$1000	.03	2000	C	A	B	2000
	(b) Set blowdown requirements	unknown	unknown	2000	C	A	A	2000
C5	IMPROVED WASTEWATER (OIL-WATER) SEPARATORS RULE							
	(a) Remove small wastewater separator exemption	$1000	3.1	2000	B	A	A	1999
	(b) Require large units to be vented to abatement devices	$3000		2000	B	A	A	1999
C6	FURTHER REDUCTION OF EMISSIONS FROM WASTEWATER TREATMENT AT REFINERIES							
	(a) Require treatment systems to be enclosed and abated or reduce emissions from wastewater stream	$10000 (a-b)	.76	2000	A	A	A	1999
	(b) Require covers for holding tanks and wastewater processing equipment			2000	A	A	A	1999
	(c) Require reductions for hydrocarbon-pond desludging	unknown	unknown	2000	A	A	A	1999
C7	REDUCTION OF EMISSIONS FROM PETROLEUM REFINERY FLARES							
	(a) Increase the capacity of blowdown recovery	unknown	.10 (ROG)	2003	B	A	A	2001 - 2003
	(b) Improve flare design and operating parameters	unknown	1.0 (NOx)	2003	C	A	A	2001 - 2003
C8	DRAINING OF LIQUID PRODUCTS/SUMPS AND PITS	$8500	1.8	2000	A	A	A	1999
D.	**COMBUSTION OF FUELS**							
D5	REDUCTION OF EMISSIONS FROM CEMENT PLANT KILNS		3.6 (NOx)					
	(b) Require flue-gas treatment to reduce NOx	$2000	.61 (PM10)	2004+	D	B	B	2004+
E.	**OTHER INDUSTRIAL/COMMERCIAL PROCESSES**							
E1	REDUCTION OF EMISSIONS FROM RUBBER PRODUCTS MANUFACTURING							
	(a) Require abatement of ROG emissions from rubber product manufacturing operations	$6000	unknown	2001	C	A	B	2000
E3	REDUCTION OF EMISSIONS FROM COMMERCIAL CHARBROILING		1.3 (ROG)					
	(a) Set ROG emission limits for commercial charbroilers	$25000	4.7 (PM10)	2004+	B	B	A	2004+

Table 4 (Cont.)
PROPOSED STATIONARY SOURCE CONTROL MEASURES

Proposed New Control Measure (not part of '94 CAP) or Measure Significantly Modified from '94 CAP Control Measure

(Unshaded) Control Measure Was Included in '94 CAP -- Schedule May Have Been Modified

#	TITLE	Cost Effectiveness $/ton reduced	Minimum ROG E.R. Potential tons/day	Rate of Reduction imp. date	Feasibility of Technology A thru D	Public Acceptance A thru D	Enforce-ability A thru D	Proposed Adoption
F.	**OTHER STATIONARY SOURCE MEASURES**							
F3	PROMOTION OF ENERGY EFFICIENCY (b) Further reductions by promotion of energy efficiency	unknown	unknown	2000	A	A	D	1998 - 2000
F5	EMISSION REDUCTION CREDITS TO MITIGATE EMISSIONS FROM VIOLATIONS AND VARIANCES	unknown	unknown	2000	B	A	C	1997
F6	ENHANCED COMPLIANCE THROUGH PARAMETRIC MONITORING	unknown	unknown	2000	A	A	A	1998 - 2000
F7	EASING OF ADMINISTRATIVE REQUIREMENTS FOR USE OF LOWER EMITTING TECHNOLOGY	unknown	2.2	2000	A	A	A	1998 - 2000
F8	LIMITATIONS ON SOLVENTS BASED ON RELATIVE REACTIVITY	unknown	unknown	2004+	D	B	B	2004+
F9	HIGH ALBEDO ROOFING AND ROAD SURFACING MATERIALS	unknown	unknown	2000	A	B	D	1998 - 2000
G.	**INTERMITTENT MEASURES**							
G3	SEASONAL LIMITATIONS ON ORGANIC LIQUID STORAGE TANK AND WASTEWATER SEPARATOR CLEANING AND REFINERY SHUTDOWNS	unknown	.50	2000	A	A	C	2000

NOTES

Cost-Effectiveness is the estimated **average** value for all sources affected by the control measure. **Minimum ROG Emission Reduction (ER) Potential** is the summer day emission reductions (of ROG, unless otherwise specified) projected for the entire control measure for the year 2000, 2003 or 2010, depending on when the emissions reductions are first expected, assuming the control measure is fully implemented in the absence of other competing control measures not currently adopted. In many cases, ranges of emission reductions are provided to address the uncertainty that exists in the estimates. **Rate of Reduction** is the estimated date that the control measure will be fully implemented. An implementation date of "2004+" means the control measure is not anticipated to be implemented until after the year 2003. It should be noted that as control measures go through the rulemaking process, more detailed information will be developed regarding feasible implementation dates. **Technological Feasibility, Public Acceptability, and Enforceability** were graded on a scale of A through D, with an A being the highest rating and a D being the lowest. **Proposed Adoption** indicates the date in which the control measure is expected to be adopted. For near-term control measures, a specific year is listed; for longer-term control measures, for which specific adoption dates are more uncertain, the anticipated planning period in which adoption is expected is specified.

Mobile Source Control Measures

This section of the '97 CAP includes control measures that reduce emissions from mobile sources. Most of these control measures encourage the retirement of older, more-polluting technologies and the introduction of new, less-polluting technologies. These control measures that reduce mobile source emissions should be distinguished from transportation control measures that attempt to reduce motor vehicle use. Though transportation control measures affect the most significant source of mobile source emissions, they are not categorized as mobile source control measures and are discussed elsewhere in the '97 CAP (see pages 35-48).

Regulation of Mobile Source Emissions

Although the term "mobile source" is not defined in the California Clean Air Act (CCAA), it is used throughout the CCAA to refer collectively to vehicular sources and other non-stationary sources. Under the CCAA, vehicular sources are self-propelled devices which may travel upon a highway (see Secs. 39039, 39060 and Vehicle Code Secs. 415, 670); automobiles, trucks, construction equipment, farm equipment, and off-road vehicles are considered to be vehicular mobile sources. "Non-vehicular" mobile sources include ships, boats, aircraft, locomotives, and lawn and garden equipment. Under the federal Clean Air Act, mobile sources other than automobiles and trucks are referred to as "nonroad" sources (i.e., ships, airplanes and trains).

The following table lists emissions from the largest contributors of Bay Area mobile source emissions in order of their ROG contribution:

1997 Mobile Source Emissions: Ozone Precursors
(summer average)

Source	ROG (tons/day)	NO_X (tons/day)
Automobiles and light-duty trucks	193	210
Light duty industrial/construction equipment	24	95
Recreational boats	17	1
Medium and heavy-duty trucks	16	80
Aircraft	14	16
Lawn, garden, and other utility engines	10	1
Other sources	11	57
Total	**285**	**460**

Mobile source emissions are regulated in three ways: (1) by establishing new equipment emission standards, (2) by testing the equipment against in-use performance standards once it is in use, and (3) by regulating the fuel used in the equipment.

In most states, much of the authority for establishing mobile source emission standards rests with the federal government, primarily EPA. In fact, the federal Clean Air Act (42 United States Code (USC) 7543) prohibits all states, except for California, from adopting emission standards for new motor vehicles. Under the federal act, California may continue to set motor vehicle emission standards, subject to federal oversight.

The CAA also prohibits states from establishing emission standards for aircraft engines (42 USC 7573) and for several categories of nonroad engines, including new locomotive engines and new engines of less than 175 horsepower used in construction or farm equipment (42 USC 7543). California can, however, establish standards for other types of nonroad engines, and other states that contain federal ozone nonattainment areas may also establish such standards, provided the standards are identical to those of California.

The California standards cover motor vehicles (including cars, motorcycles, and trucks), heavy industrial and construction equipment, off-highway vehicles like dirt bikes and all-terrain vehicles, and lawn and garden and other utility engines.

Regulation of Motor Vehicle Emissions

Vehicle Emission Standards. California has set exhaust emission standards for new motor vehicles since model year 1966, two years before nationwide standards were established. The California standards cover passenger cars, motorcycles, and light, medium, and heavy-duty trucks. In 1970, when the federal Clean Air Act was adopted, California was granted authority to continue its motor vehicle emission standards program, and under the California program, vehicular sources are regulated primarily by the Air Resources Board.

In-Use Performance Standards. Although new equipment emission standards are the primary way in which mobile source emissions are regulated, a second way in which they are regulated is through in-use performance standards. The CAA (42 USC 7511a) requires all areas in the nation that have not attained the federal ozone standard to have a motor vehicle inspection and maintenance (I&M), or "smog check", program. In addition, any area that has a basic I&M program must maintain it. These programs are designed to help ensure that motor vehicle emission control systems continue to operate properly. The Bay Area has had an I&M program since 1984, and responsibility for the state's I&M program rests with the California Bureau of Automotive Repair (BAR). California's smog check program was revised in 1996 and is now called ***Smog Check II***. There are three types of Smog Check programs - change of ownership, basic, and enhanced - and the air quality in an area determines the type of program that applies. The Bay Area is a basic program area. See "Motor Vehicle Inspection and Maintenance Program" on page 55-56 for more detailed information on ***Smog Check II.***

Regulation of Fuels. The third way that mobile source emissions are controlled is through fuel regulation. Since the majority of light-duty motor vehicles, which are the largest source of mobile source emissions, are fueled by gasoline, the CAA (42 USC 7545) requires reductions in Reid vapor pressure of gasoline to minimize ozone formation. The state's most recent effort in this area is the reformulated gasoline (RFG) program, which took effect in 1996. Efforts to regulate or reformulate fuels provide the added benefit of effecting emission reductions regardless of whether the gas is used in motor vehicles or other equipment.

The three state programs - emission standards, RFG, and ***Smog Check II*** - are the primary programs for reducing emissions from mobile sources. No air district may adopt its own motor

vehicle emission standards, fuel regulations, or I&M program. However, air districts, under specific grants of authority in the CCAA, may develop other programs to reduce motor vehicle emissions. For example, air districts may adopt control measures increasing the use of low-emission vehicles by fleet operators (Sec. 40919). They may also adopt transportation control measures to reduce use of motor vehicles. In addition, air districts are given authority to increase vehicle registration fees in order to fund various programs aimed at reducing emissions from motor vehicles (Secs. 44220, 44241).

Regulation of Light-Duty Industrial, Construction, and Farm Equipment

The CAA prohibits states from establishing emission standards for light-duty (less than 175 hp) industrial and construction equipment; hence, EPA maintains jurisdiction over these sources. Because nonroad compression ignition (CI) engines (i.e., diesel engines) produce a significant portion of the nonroad NO_x inventory, EPA has adopted national emission standards for CI engines greater than 50 hp. These "Tier 1" standards are being phased in between 1996 and 2000. California is authorized to, and has established, emission standards for heavy-duty equipment 175 hp and greater, but these engines are a much smaller source of Bay Area emissions than light-duty engines.

Regulation of Recreational Boat Emissions

Among the major sources of Bay Area mobile source emissions for which California may establish emission standards, recreational boat engines are the only category not yet regulated by the state. EPA, however, has adopted federal standards for new outboard, personal watercraft, and jet boat engines beginning with model year 1998. Some manufacturers introduced new clean engines in 1997.

Regulation of Aircraft Emissions

The authority for regulating aircraft emissions lies with EPA. EPA adopted hydrocarbon (HC), smoke, NO_x, and carbon monoxide (CO) emission standards for gas turbine engines in civil aircraft over 20 years ago, but subsequently dropped the NO_x and CO standards. Almost all commercial aircraft use gas turbines subject to the HC and smoke standards. In 1997, EPA adopted existing United Nations International Civil Aviation Organization (ICAO) NO_x and CO standards for these gas turbine engines.

Regulation of Emissions From Lawn and Garden Equipment

The state of California has the authority to regulate utility engines used in lawn and garden equipment. Under California regulations adopted in 1992, all utility engines used in lawn and garden equipment sold in California must meet progressively stricter emission requirements, with first tier standards having gone into effect in 1995, and much stricter standards going into effect in 1999. In 1995, EPA adopted nationwide standards similar to the California first tier

standards. EPA has also proposed more stringent "Phase 2" standards to be implemented in 2001 and later.

Regulation of Other Mobile Sources

Other mobile source categories currently make relatively minor contributions to the Bay Area mobile source inventory. Ship engines contribute about 1.4 tons of ROG and 5.3 tons of NO_x per day. Emissions from ship engines are currently not regulated. However, EPA is participating in international negotiations to create marine diesel emission standards under the International Convention for the Prevention of Pollution from Ships (MARPOL). The MARPOL standards are expected to apply to engines installed on or after January 1, 2000. EPA is also working on emission standards for diesel engines in the smaller domestic vessels not covered by MARPOL.

Locomotives in the Bay Area emit about 0.5 tons of ROG and 11.5 tons of NO_x per day. Under the federal Clean Air Act (42 USC Sec. 7573), regulation of locomotive emissions is left to EPA. In 1997, EPA proposed locomotive emission standards that would take effect in 2000, with more stringent standards taking effect in 2005.

Rationale for CAP Mobile Source Control Measures

In the Bay Area, more ozone-forming emissions come from mobile sources than from any other anthropogenic source (see Table 1). Although almost all categories of mobile source emissions are currently regulated, further emission reductions from mobile sources, and primarily from motor vehicles, are an important component of the Bay Area strategy for attaining state clean air standards. The state programs mentioned above are critical to achieving these emission reductions.

Although the state motor vehicle and fuel programs will significantly reduce mobile source emissions in the Bay Area, the Bay Area is still expected to fall short of achieving the state ozone standard. As a result, the Clean Air Plan proposes a small set of mobile source control measures. These control measures will achieve only modest emission reductions beyond those achieved through the state programs, but they represent an attempt to point the way toward the introduction of new technologies that, if widely adopted, could produce truly significant emission reductions in the future.

Background for Mobile Source Strategy

Enormous strides have been made in reducing emissions from motor vehicles. For instance, in 1965, before emission controls appeared, the average new car produced hydrocarbon emissions of about 10 grams per mile, whereas now any new 1997 cars sold in California are required to meet an emission standard of 0.25 grams of hydrocarbons per mile.

For a number of reasons, however, real-world reductions in motor vehicle exhaust emissions may not be as great as the figures above would lead one to expect. First, these numbers reflect performance on emission tests in which cars are put through test cycles that simulate driving

conditions, but they may not reflect real-world driving. If, for example, hard acceleration or high speeds common in real-world driving are not reflected in test cycles, emissions will be underestimated. Second, emission control system performance degrades over time, and this degradation is not well understood. For example, some emission control systems may exhibit increased variability with age rather than a linear decline in performance. Third, social and economic factors may encourage continued use of older cars with outmoded, and perhaps poorly maintained or defective, emission controls. Fourth, I&M programs like California's ***Smog Check II*** may be less effective at identifying and repairing cars with poorly performing emission controls than previously thought. Fifth, increases in the ownership and use of motor vehicles may significantly undercut the emission reductions achieved by the introduction of new vehicles.

Many of the problems in gauging real-world emissions from motor vehicles derive from use of petroleum-fueled internal combustion (IC) engines to power motor vehicles. In combusting petroleum, these engines produce by-products such as volatile organic compounds and nitrogen oxides, the primary ingredients of ozone, along with carbon dioxide, a greenhouse gas that contributes to global warming (see page 61). Since creation of these by-products is unavoidable in the combustion process, these pollutants must be removed or reduced once they are created. The emission control systems that do this are complex because motor vehicle engines must deliver power over an extraordinary range of constantly-changing operating conditions and the systems must be effective throughout this range.

A number of alternative motor vehicle technologies offer ways around the problems inherent in petroleum-fueled IC engines. These technologies include natural gas vehicles, electric vehicles using batteries or other on-board storage devices, hybrid electric vehicles using both an electric motor and an IC engine, and fuel cell electric vehicles. The Air District will encourage all of these technologies as part of its overall mobile source strategy.

Mobile Source Strategy

The Air District's current mobile source strategy is a long-term strategy, focusing on encouraging a transition from conventional petroleum-fueled internal combustion engines to new, lower-emitting technologies. Current programs generally either encourage retirement of old technologies or the introduction of new ones, and they complement the Air District's transportation control measures discussed on pages 35-48. Under TCM 17, in particular, the Air District will use its Transportation Fund for Clean Air (TFCA) to encourage new transportation technologies. TFCA dollars have already supported numerous projects involving electric and natural gas vehicles.

Table 5 lists the mobile source control measures to be developed and proposed for adoption. Included in the table are:

- Brief descriptions of proposed control measures
- Estimated cost-effectiveness
- Estimated potential emission reductions
- Projected implementation dates

- Ratings of technical feasibility, public acceptability, and enforceability
- Proposed adoption dates

Table 5 does not include the Air District's Vehicle Buy-Back program. This program is listed in Table 2 as an implemented program, although the Air District plans to continue the program.

Collectively, the proposed mobile source control measures are expected to reduce reactive organic gases by 0.3 tons per day by 2000 and 1.1 tons per day by 2003. They are expected to reduce NO_x emissions by 0.8 tons per day by 2000, 1.4 tons per day by 2003, and 1.9 tons per day when fully implemented. More detailed information on the control measures is available in Appendix F (Volume III of the CAP).

Table 5
PROPOSED MOBILE SOURCE CONTROL MEASURES

Proposed New Control Measure (not part of '94 CAP) or Measure Significantly Modified from '94 CAP Measure

(Unshaded) Measure Was Included in '94 CAP -- Schedule May Have Been Modified

#	TITLE	Cost Effectiveness $/ton reduced	Minimum ROG E.R. Potential tons/day	Rate of Reduction imp. date	Technology. Feasibility A thru D	Public Acceptance A thru D	Enforce. A thru D	Proposed Adoption
M1	MOBILE SOURCE EMISSION REDUCTION CREDIT PROGRAM							
	(d) Remote Sensing of Gross Emitters	unknown	unknown	2001	A	A	A	2000
	(e) Credits for scrapping lawn and garden equipment	unknown	unknown	2000	A	A	A	1998
	(f) Credit for scrapping recreational boat engines	unknown	unknown	2000	A	A	A	1998
M2	AIRPORT GROUND SUPPORT EQUIPMENT	unknown	.28 (ROG) .71 (NOx)	2000	A	A	B	1999
M3	GROUND POWER SYSTEMS AT AIRPORT TERMINALS	unknown	.01 (ROG) .08 (NOx)	2000	A	A	A	1999
M4	LOW EMISSION VEHICLE FLEET OPERATIONS	unknown	.80 (ROG) .60 (NOx)	2001	A	A	C	2000

NOTES

Cost-Effectiveness is the estimated **average** value for all sources affected by the control measure. **Minimum ROG Emission Reduction (ER) Potential** is the summer day emission reductions (of ROG, unless otherwise specified) projected for the entire control measure for the year 2000, 2003 or 2010, depending on when the emissions reductions are first expected, assuming the control measure is fully implemented in the absence of other competing control measures not currently adopted. In many cases, ranges of emission reductions are provided to address the uncertainty that exists in the estimates. **Rate of Reduction** is the estimated date that the control measure will be fully implemented. An implementation date of "2004+" means the control measure is not anticipated to be implemented until after the year 2003. It should be noted that as control measures go through the rulemaking process, more detailed information will be developed regarding feasible implementation dates. **Technological Feasibility, Public Acceptability, and Enforceability** were graded on a scale of A through D, with an A being the highest rating and a D being the lowest. **Proposed Adoption** indicates the date in which the control measure is expected to be adopted. For near-term control measures, a specific year is listed; for longer-term control measures, for which specific adoption dates are more uncertain, the anticipated planning period in which adoption is expected is specified.

Transportation Control Measures

On-road motor vehicles are the largest source of air pollution in the Bay Area (see Table 1 and Figures 1 and 2). This section addresses control measures to reduce emissions from motor vehicles by reducing vehicle use.

CCAA Transportation Requirements

The California Clean Air Act (CCAA) states that, in developing attainment plans, air districts shall "focus particular attention on reducing the emissions from transportation and areawide emission sources" (Sec. 40910). The Act specifically requires air districts to adopt, implement, and enforce transportation control measures (TCMs). TCMs are defined as "any strategy to reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion for the purpose of reducing motor vehicle emissions" (Sec. 40717, subdivision (g)).

In February 1990, ARB released a list of "reasonably available" TCMs in its *CCAA Guidance #2*. The control measures include employer-based trip reduction rules, trip reduction rules for other sources that attract vehicle trips, management of parking supply and pricing, regional high occupancy vehicle (HOV) system plans, comprehensive bus and rail transit improvements, land development policies that support reductions in vehicle trips, and development policies to strengthen on-site transit access for new and existing development. Because the Bay Area is classified as a "serious" ozone nonattainment area with respect to state standards, the CCAA also requires that TCMs be sufficient to substantially reduce the rate of increase in vehicle trips and vehicle miles traveled (VMT).

In addition to developing "reasonably available" TCMs, air districts are required to develop an indirect source program to reduce emissions from sources that generate or attract motor vehicle trips.

Rationale for Transportation Control Measures

Light-duty motor vehicles have become much cleaner over the past 25 years, due to stronger tailpipe emission limits, cleaner fuels, and the Inspection and Maintenance (I&M) program. With these improvements, today's new cars are about 90 percent cleaner than their counterparts of 30 years ago. Actions by the California Air Resources Board (see pages 53-54) will result in even cleaner new cars over the next decade. These control measures, coupled with natural turnover in the vehicle fleet, will greatly reduce motor vehicle emissions (see Table 1).

Despite the significant progress, emissions reductions may not have been as great as expected. Motor vehicle use has increased rapidly, slowing progress toward attainment of state clean air standards. Over the past twenty years, vehicle miles traveled (VMT) have increased nearly three times faster than population. While California's population increased by 2 percent per year during the 1980s, VMT increased by 5 percent per year. During the 1980s, Bay Area VMT growth rates averaged 3.5 percent per year and population growth rates averaged 1.6 percent per year. Bay Area growth rates projected for the future are much lower: through 2010, population is expected to grow by 1.1 percent per year and VMT is expected to grow by 1.4 percent per year.

Consequently, the Bay Area is still expected to fall short of attainment of the state ozone standard. Therefore, in addition to stationary and mobile source control measures, transportation control measures (TCMs) are proposed.

Overview of TCM Plan

The TCM plan for the '97 CAP is an integrated set of 20 control measures designed to meet the specific conditions and needs of the Bay Area. These control measures will be implemented in three phases, with certain TCMs spanning all phases. Phase I includes "reasonably available" control measures that can be adopted and/or partially implemented in the near term, prior to the 2000 CAP. Many of the Phase I projects are shown in the *1997 Transportation Improvement Program,* prepared by MTC. Phase II includes control measures that are expected to be implemented between 2001 and 2003. Many of the transportation improvements in Phase I and Phase II are funded by federal, state and local transportation agencies. Phase III includes control measures which will be implemented after 2003, or that require state enabling legislation for implementation. Many of the Phase III control measures are not currently funded. Bay Area agencies are seeking the additional funding and/or legislative authority required for the control measures in this CAP.

The TCM plan is best understood as a set of complementary control measures that fall into the following functional categories: pricing reform, demand management, user incentives, intermittent controls, voluntary employer-based trip reduction, mobility improvements and support measures. Brief descriptions of the TCMs are provided in Table 6. Expanded descriptions are contained in Appendix E (Volume II of the CAP).

Implementation Issues

Successful implementation of the TCM plan will require cooperation among many public agencies, the private sector and the citizens of the Bay Area. Agencies responsible for implementing the transportation control measures include MTC, ABAG, Caltrans, transit operators, cities and counties, school districts, ridesharing agencies and congestion management agencies. Recognizing that many agencies are already taking actions to help improve regional air quality, the Air District will strive to build on these efforts in implementing transportation control measures.

While public agencies are responsible for developing and operating the region's transportation system, the general public and the private sector are the ultimate users of the system. These groups will play a critical role in determining the success of the plan, both in their willingness to support policies to implement the plan and in their willingness to reduce motor vehicle trips in favor of enriched transportation alternatives. Table 6 identifies implementing agencies and schedules for each of the TCMs.

TABLE 6
PROPOSED TRANSPORTATION CONTROL MEASURES

	DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #1 **Support Voluntary Employer-Based Trip Reduction Programs**	■ Provide assistance to regional and local ridesharing organizations; advocate legislation to maintain and expand incentives (e.g., tax deductions/credits)	MTC, Caltrans, cities, counties, CMAs, Air District	Ongoing
	■ Provide assistance to employers, cities, counties: - Assistance in developing/enhancing employer programs; recognition of outstanding programs - Information and referral - Employer networks	MTC's Regional Rideshare Program, CMAs, MTC, Air District	Ongoing
TCM #2 **Adopt Employer-Based Trip Reduction Rule**	■ ***TCM DELETED*** - Sec. 40929 does not permit air districts to require mandatory employer-based trip reduction programs		
TCM #3 **Improve Areawide Transit Service**	■ Increase local bus service as revenues become available	MTC, transit operators	Depends on funding
	■ Support transit improvements defined in MTC's Regional Transportation Plan	MTC, transit operators	Depends on funding
	■ Improve transit access to airports	MTC, transit operators, airports	Depends on funding
	■ Replace transit buses with clean-fuel buses	MTC, transit operators, Air District	Depends on funding

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION CONTROL MEASURES

	DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #4 **Improve Regional Rail Service**	■ BART to SF International Airport	BART, MTC	Phase II
	■ Extend Tasman LRT (12 miles, 19 stations)	SCVTA, MTC	Phase II
	■ Extend CalTrain to downtown San Francisco	Peninsula JPB, MTC	Phase II
	■ Implement light rail on Third Street (Bayshore Corridor) in San Francisco	MUNI	Phase II
	■ Implement light rail on heavily patronized routes in AC Transit's service area	AC Transit, MTC	Phase III
	■ Implement light rail expansion in Santa Clara County	SCVTA	Phase III
	■ Implement Fremont - South Bay rail connection	MTC	Phase III
	■ Implement new commuter services: Santa Rosa to Larkspur, Vacaville to Oakland	MTC	Phase III
TCM #5 **Improve Access to Rail and Ferries**	■ Improve feeder bus service to rail and ferries	Transit operators, MTC	Limited implementation ongoing; expanded implementation depends upon funding
	■ Improve bicycle and pedestrian facilities at stations and improve access to rail/ferry stations	MTC, transit operators	
	■ Increase private shuttles from transit stations to employment centers	Employers, TMAs, CalTrain, BART	
	■ Encourage BART and Caltrain to provide preferential parking for electric vehicles	MTC, Air District	

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION CONTROL MEASURES

	DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #6 **Improve Inter-regional Rail Service**	■ Implement additional interregional rail service in Capitol (Auburn-Sacramento-Oakland-San Jose) Corridor	Capitol Corridor JPB, Amtrak, MTC, Southern Pacific	Increase service from 4 round trips per day (current) to six round trips per day by 1999 and 10 round trips by 2003
	■ Implement commuter service between Stockton and San Jose	MTC, San Joaquin Regional Rail Commission, Alameda County, Santa Clara County	Start-up 1998
	■ Expand Amtrak's San Joaquin service between Stockton and Oakland	Amtrak, MTC	Phase III
	■ Implement new commuter service between Santa Cruz and San Jose	Unknown	Phase III
	■ Implement new daily service between the Bay Area and Eureka	Unknown	Phase III
	■ Consider high speed rail between downtown San Francisco and Los Angeles	High Speed Rail Commission	Phase III
TCM #7 **Improve Ferry Service**	■ Expand ferry service to San Francisco from Vallejo (2 new vessels) and Larkspur (high speed vessel)	City of Vallejo, Golden Gate Transit	Phase I
	■ Implement new service from Port Sonoma to San Francisco	Private operator, PUC	Phase III
	■ Implement new service between SF and Oakland airports	MTC	Phase III

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION CONTROL MEASURES

	DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #8 **Construct Carpool/ Express Bus Lanes on Freeways**	■ Expand existing HOV network, based on HOV Master Plan Update, where beneficial to air quality	Caltrans, MTC	Subject to analysis of each segment
	■ Implement HOV support facilities--park & ride lots, special HOV ramps that provide direct connections, HOV bypass lanes at ramp meters, express bus service	Caltrans, MTC, transit operators	All phases
	■ Monitor vehicle occupancy to maintain travel time advantages and stimulate the formation of new carpools	Caltrans, MTC's Regional Rideshare Program	All phases
	■ Convert general purpose lanes to HOV to provide significant time savings for transit, allow projects to be implemented earlier or avoid entirely the cost and dislocation associated with freeway widenings.	Caltrans	All phases

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION CONTROL MEASURES

	DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #9 **Improve Bicycle Access and Facilities**	■ Improve and expand bicycle lane system by providing bicycle access in plans for all new road construction or modifications	Cities, counties, Caltrans	Depends on funding
	■ Establish and maintain bicycle advisory committees in all nine Bay Area counties	Cities, counties, MTC	Ongoing
	■ Designate a staff person as a Bicycle Program Manager	Cities, counties	Ongoing
	■ Develop and implement comprehensive bicycle plans	Cities, counties, MTC	Ongoing
	■ Encourage transit operators to accommodate bicycles on transit vehicles, including removal of peak-hour restrictions	MTC, transit operators, BAAQMD	Ongoing
	■ Encourage Caltrans to accommodate bicycles on all bridges, including the San Francisco - Oakland Bay Bridge	MTC, Air District	Depends on funding
	■ Encourage employers and developers to provide bicycle access and facilities (see also TCM 15)	Cities, counties, Air District	Ongoing
	■ Provide bicycle safety education	Cities, counties, school districts	Ongoing

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION CONTROL MEASURES

	DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #10 **Youth Transportation**	■ Encourage carpooling among students with access to cars	MTC's Regional Rideshare Program, school districts	Phase I
	■ Replace school buses with clean-fuel vehicles	School districts, Air District	Depends on funding
	■ Offer transit ride discounts to youth and students	Transit operators	Depends on funding
	■ Establish special carpool formation services for parents, students and staff at Bay Area elementary and secondary schools	MTC via Regional Rideshare Program	Depends on funding
TCM #11 **Install Freeway/ Arterial Metro Traffic Operations System (MTOS)**	■ Complete initial 45 mile segment of MTOS (MTOS includes transportation operational strategies, traffic surveillance, traffic advisory signs, incident management, ramp metering)	Caltrans, MTC, Partnership	Phase I
	■ Define and implement traffic operations system to improve the flow of traffic on the regional transportation network	Caltrans, MTC	Phase II
	■ Continue and expand Freeway Service Patrol	Caltrans	Phase I
TCM #12 **Improve Arterial Traffic Management**	■ Continue and expand local signal timing programs	MTC, cities, CMAs, Caltrans	Ongoing
	■ Study signal preemption for buses on arterials with high volume of bus traffic	Cities, transit operators, CMAs	Ongoing
	■ Improve arterials for bus operations and to encourage bicycling and walking	Cities, transit operators, CMAs	Ongoing

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION CONTROL MEASURES

	PROPOSED DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #13 **Transit Use Incentives**	■ Expand Regional Transit Connection (RTC) ticket distribution through employers, and continue "Commuter Check" program for employers to subsidize employee transit passes	MTC's Regional Rideshare Program, transit agencies, Commuter Check Corp., employers	Phase I
	■ Construct transit centers identified in AC Transit's Comprehensive Service Plan	AC Transit	Phase I
	■ Translink (universal fare card) on AC Transit, BART, CCCTA, Golden Gate Transit, LAVTA and MUNI	MTC, Transit operators	Phase I
	■ Develop transit incident response plan	MTC, Transit Operators	Phase I
	■ Provide selective fare reductions: reduced off-peak fares, reduced fares for special events, reduced fares for lines with excess capacity, downtown free fare zones, etc.	MTC, Transit Operators	Phase III
TCM #14 **Improve Rideshare/ Vanpool Services and Incentives**	■ Develop long-term funding plan for Regional Ridesharing Program	MTC	Phase I
	■ Implement Traffic Management Programs that promote ridesharing and vanpooling	Caltrans	Ongoing
	■ Explore potential demand for medium-distance (20-30 miles) vanpools and develop incentives for this market if demand exists	MTC's Regional Rideshare Program	Phase I
	■ Explore potential demand for real-time ridesharing	MTC's Regional Rideshare Program	Phase III

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION CONTROL MEASURES

	PROPOSED DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #15 **Local Clean Air Plans, Policies and Programs**	■ Encourage cities and counties to incorporate air quality beneficial policies and programs into local planning and development activities, with a particular focus on subdivision, zoning and site design measures that reduce the number and length of single-occupant automobile trips.	ABAG, BAAQMD, MTC in collaboration with cities and counties	Ongoing - incentives will be developed in Phase I
	■ Develop subregional planning pilot projects	ABAG	Ongoing
	■ Provide technical assistance to local government agencies	Air District	Ongoing
	■ Publicize noteworthy examples of local clean air plans, policies and programs, as well as endorse noteworthy development projects	Air District, MTC	Ongoing
TCM #16 **Intermittent Control Measure/ Public Education**	■ Encourage public to reduce motor vehicle use and other polluting activities on predicted ozone exceedance days through "Spare the Air" program	Air District	Ongoing
	■ Continue public education program to inform Bay Area residents about status of regional air quality, health effects of air pollution, sources of pollution and measures that individuals and communities can take to help improve air quality	Air District with public outreach steering committee	Ongoing
	■ Continue and expand the Bay Area Clean Air Partnership (BayCAP), focusing on voluntary actions by employers to improve air quality	Air District, employer associations	Ongoing

TABLE 6 (Cont'd)
PROPOSED TRANSPORTATION MEASURES

	PROPOSED DESCRIPTION	IMPLEMENTING AGENCIES	SCHEDULE
TCM #17 **Conduct Demonstration Projects**	■ Promote demonstration projects to develop <u>new</u> strategies to reduce motor vehicle emissions. Potential projects include: - Electronic toll collection - Low emission fleet vehicles - LEV refueling infrastructure	 Caltrans Air District Air District	 Phase I Phase I Phase I
TCM #18 **Transportation Pricing Reform**	■ Advocate legislation for authority and develop and promote revenue measures: - Congestion pricing on bridges - Parking cash out - Regional gas tax of $0.10 - Regional gas tax of $0.50 - Regional gas tax of $2.00 - Smog-based registration fees - New vehicle "feebates" ■ Use revenues to fund transportation alternatives, user incentives and equity programs	Air District, MTC, State Legislature, voters	 Phase I Phase I Phase I Phase II Phase III Phase III Phase III
TCM #19 **Pedestrian Travel** ***(new measure added to 1997 CAP)***	■ Review/revise general/specific plan policies to promote development patterns that encourage walking and circulation policies that emphasize pedestrian travel and modify zoning ordinances to include pedestrian-friendly design standards ■ Include pedestrian improvements in capital improvements program ■ Designate a staff person as a Pedestrian Program Manager	Cities, counties Cities, counties Cities, counties	Ongoing Ongoing Ongoing
TCM #20 **Promote Traffic Calming Measures** ***(new measure added to 1997 CAP)***	■ Include traffic calming strategies in the transportation and land use elements of general and specific plans ■ Include traffic calming strategies in capital improvements programs	Cities, counties Cities, counties	Ongoing Ongoing

TCM Emission Reductions

Emissions reductions were calculated for TCMs for 2005 and 2015, years for which MTC makes forecasts of travel. Emissions reductions for 2005 are based on implementation of all Phase I and Phase II TCMs. Emissions reductions for 2015 include full implementation of all TCMs including the unfunded Phase III measures. MTC is pursuing a regional gasoline tax. Individual counties are pursuing either a rollover of their existing transportation sales taxes or new transportation sales taxes. Both the regional and county taxes could provide the revenue for implementation of Phase III TCMs. Furthermore, a change in the political or economic climate that would be more favorable to transportation pricing reform could provide additional revenue for Phase III TCMs.

Emissions reductions from transportation control measures implemented between 1997 and 2005 are expected to total approximately 8 tons/day of reactive organic gases and approximately 11 tons/day of nitrogen oxides. When fully implemented in 2015, TCMs are expected to reduce reactive organic gases up to 12 tons per day and nitrogen oxides up to a 30 tons per day. The expected emission reductions for each TCM is shown in Table 7.

TABLE 7

REDUCTION IN EMISSIONS FOR TCMS

#	Control Measure	Tons/Day Emission Reduction 2005 ROG	2005 NO_x	2015 ROG	2015 NO_x
1	Support Voluntary Trip Reduction Programs	-0-	-0-	-0-	-0-
2	Employer-Based Trip Reduction ***TCM Deleted***				
3	Improve Areawide Transit Service				
	a) Transit Service	-0-	-0-	-0-	-0-
	b) Clean-Fuel Transit Vehicles	0.01	0.01	<0.01	0.01
4	Improve Regional Rail Service	0.08	0.08	0.06	0.07
5	Improve Access to Rail and Ferries	0.04	0.03	0.03	0.03
6	Improve Interregional Rail Service	0.02	0.03	0.02	0.03
7	Improved Ferry Service	0.01	0.01	<0.01	0.01
8	Construct Carpool/Express Bus Lanes on Freeways*	0.01	0.01	0.03	0.03
9	Improve Bicycle Access and Facilities	0.05	0.03	0.07	0.05
10	Youth Transportation				
	a) School Bus Service	<0.01	<0.01	<0.01	<0.01
	b) Clean-Fuel School Buses	0.01	0.04	0.01	0.03
11	Install Freeway/Arterial Metro Traffic Operations System (MTOS)*	0.10	0.01 increase	0.14	<0.01
12	Improve Arterial Traffic Management*	0.10	0.05	0.20	0.12
13	Transit Use Incentives	0.04	0.04	0.03	0.03
14	Improve Rideshare/Vanpool Services and Incentives	-0-	-0-	-0-	-0-
15	Local Clean Air Plans, Policies and Programs	0.02	0.01	0.01	0.01
16	Intermittent Control Measure/Public Education	-0-	-0-	-0-	-0-
17	Conduct Demonstration Projects				
	a) Clean Air Vehicle Demonstrations	0.02	0.04	0.01	0.04
	b) Other Demonstrations	<0.01	<0.01	<0.01	<0.01
18	Transportation Pricing Reform	7.16	9.66	10.91	26.39
19	Pedestrian Travel	0.71	0.84	0.72	1.59
20	Promote Traffic Calming Measures	0.54	0.84	0.54	1.59
	TOTAL	**8.06**	**11.45**	**11.83**	**29.72**

*Although emissions reductions have been calculated for these TCMs, some studies have shown that individual projects can increase emissions. An emissions increase would result from additional VMT that is not fully offset by reduced emissions due to higher vehicle speeds. Also, higher speeds can induce additional trips that are not accounted for using current transportation modeling practices. TCMs 8 and 11 may accelerate suburban and exurban land use changes that increase per capita VMT and trips. These effects would be counter to the transportation performance standards of the California Clean Air Act.

For TCMs 1, 3a, 14 and 16, no *future* emissions reductions are expected since these TCMs represent maintenance of current efforts. Since current estimates do not show a greater percentage of people taking transit, carpooling or vanpooling in the future, we have not assigned emissions reductions to TCMs that support these modes. However, if funding for these services and programs were not made available at today's levels adjusted for inflation, as expected, emissions would clearly increase. For some of these TCMs, emissions reductions shown in Table 3, "Implemented Transportation Control Measures," may provide an indication of the relative benefits of these services and programs.

Meeting CCAA Performance Standards

In addition to contributing toward the achievement of emission reduction requirements, TCMs are also required to achieve the transportation performance standards in the California Clean Air Act.

For the Bay Area's classification ("serious") the CCAA calls for a substantial reduction in the rate of increase in vehicle trips and VMT. As mentioned earlier, VMT has increased at nearly three times the rate of population growth over the past twenty years. It is expected that VMT and trips will grow by approximately 1.4 percent per year and 1.8 percent per year, respectively, a decrease in the rate forecasted in the 1994 CAP for VMT, and a slight increase from the previous rate for vehicle trips.

Monitoring

Monitoring is necessary to gauge TCM implementation progress, to determine effectiveness of TCMs in reducing motor vehicle emissions, and to measure progress toward the CCAA transportation performance standards. Monitoring results can also be useful for refining TCMs during each triennial plan revision.

MTC and the Air District have developed a TCM monitoring plan and protocol. The monitoring plan will be based on information that is regularly collected by MTC and Caltrans. For additional information, see Appendix B – "Transportation Performance Standards Monitoring."

Emission Reductions

Table 8 shows the emission reductions estimated for all of the control measures in this Plan, based on present source inventory data and methodologies. The emissions reductions do not include control measures that have been adopted from previous CAPs, even if those control measures have future implementation dates. Emissions reductions from measures that have been adopted are now included in baseline emissions. These are planning estimates; actual future year emission reductions will depend upon refined inventory data, specific requirements of rules as adopted, how programs are actually implemented and degree of compliance.

TABLE 8

PERCENTAGE RATE OF EMISSION REDUCTIONS WITH PROPOSED MEASURES

	1990 (Base Year)		1994		1997		2000 (With '97 CAP)		2003 (With '97 CAP)		2010 (With '97 CAP)	
	ROG	*NOx*	*ROG*	*NOx*	*ROG*	*NOx*	*ROG*	*NOx*	*ROG*	*NOx*	*ROG*	*NOx*
Baseline Emissions tons/day (tpd)	687	708	576	662	492	598	449	530	413	474	365	438
Reduction from *new* control measures (tpd)							30	5	37	11	60	36
Total Emissions (tpd)*	687	708	576	662	492	598	419	525	376	463	305	402
Annual Reduction Rate (percent)**	not applicable		4.04%	1.62%	4.05%	2.22%	3.91%	2.59%	3.49%	2.66%	2.78%	2.16%
Cumulative Reduction Rate (percent)	not applicable		16%	7%	28%	16%	39%	26%	45%	35%	56%	43%

* Total anthropogenic (man-made) emissions in the Bay Area.

** Percent per year, calculated from the 1990 base year.

Need for New Legislation

Some of the transportation control measures proposed in this Plan will require new legislative authorities for successful implementation. Regional and local agencies will need to develop a coordinated legislative program for TCM 18 (Transportation Pricing Reform) to allow full implementation of other TCMs and authority for market-based measures.

The affected agencies and other interested groups will work expeditiously to develop needed legislation, seek sponsors, and promote passage of laws to enable implementation of all of the proposed TCMs. Assembly Bill 595 (Brown, 1997), if enacted, would enable the region to conduct a vote on a $0.10/gallon gasoline sales tax. As of September 15, 1997, this bill was on Governor Wilson's desk.

COST-EFFECTIVENESS ESTIMATES

Section 40922 of the CCAA requires an assessment of the cost-effectiveness of proposed control measures and a ranking of the control measures. Section 40913(b) requires a determination by the Air District Board that the Plan is a cost-effective strategy to achieve attainment of state standards by the earliest practicable date.

Cost-effectiveness can be estimated with confidence for some control measures where the source characteristics, pollution reduction technology, and economic factors are well known.

Lacking any of these, the estimates are less certain. Best available estimates are provided in Table 9. In some cases, where uncertainties are great, the costs are listed as "unknown."

TABLE 9
COST EFFECTIVENESS RANKINGS

Stationary and Mobile Source Measures	
$1,000/ton*	A18 B8 C3(b) C4(a) C5(a)
$2,000/ton	A1 A3(b) A5(b) A6(b) A7 A8 A9(b) A20 B2 D5(b)
$3,000/ton	C5(b)
$4,000/ton	A16 B5
$6,000/ton	A14(a) E1
$8,500/ton	C8
$10,000/ton	C1 C6(a) C6(b)
$19,000/ton	A9(a)
$25,000/ton	E3
$42,000/ton	B6
Unknown	A15 A17 A19 C4(b) C6(c) C7 F3 F5 F6 F7 F8 F9 G3 M1 M2 M3 M4
* $ per ton of ROG (NO_x for "D" control measures)	

Transportation Control Measures**	
Up to $25,000/ton ROG	TCMs 3 (clean air buses only), 10 (clean air buses only), 17 (clean air vehicles only), 19, 20
$25,000 - $50,000/ton	TCM 1
$100,000 - $250,000/ton	TCMs 5, 6, 7, 9, 11, 13
$250,000 - $500,000/ton	TCM 12
$2,000,000 - $3,000,000/ton	TCMs 4, 8
Unknown or not applicable	TCMs 14, 15, 16, 17, 18
** The ranking above was based on "gross" TCM costs. Net costs, after consideration of travel time savings, could be significantly lower.	

Transportation control measures are especially problematic for cost-effectiveness analysis for the following reasons:

- The effectiveness of TCMs depends in part upon human behavior and choices that are difficult to predict or measure.
- The costs may be large, especially if large capital investments and infrastructure improvements are involved.
- It is difficult to assign a cost to the air pollution aspects alone; TCMs are often intended to meet several different societal goals, including congestion relief, mobility needs, and public safety requirements.
- The methodology and analytical tools for TCMs are less developed than those for stationary sources.

- There are differing opinions about the validity of reducing gross TCM costs by the value of the time savings to travelers and vehicles. Since TCMs reduce congestion and thereby reduce travel time, in planning analyses, TCM net costs are reduced by savings in travel time.

Recognizing these factors, and consistent with ARB guidance, we list and rank TCM cost-effectiveness separately from stationary and mobile source control measures.

STATIONARY AND MOBILE SOURCE RULE DEVELOPMENT SCHEDULE

Each December, the Air District Board of Directors approves an annual regulatory schedule, and notifies ARB of its expected rule development schedule for the following calendar year, as required by the CCAA. Table 10 presents the Air District's annual regulatory agenda for the three years covered by the '97 CAP, 1998-2000, including rules expected to be adopted by the Board in the fourth quarter of 1997. The three-year schedule is presented so that affected source categories may anticipate rule development activity, recognizing that any particular control measure may be advanced or delayed.

TABLE 10

ANNUAL REGULATORY AGENDA

1997 — REGULATORY AGENDA (4th Quarter)

A7	Improved Can and Coil Coating Rule
A18b	Substitute Solvents Used for Cleanup of Coatings
C3b	Control of Fittings at Refineries and Chemical Plants
F5	Emission Reduction Credits to Mitigate Emissions from Violations and Variances

1998 — REGULATORY AGENDA

A1b	Improved Architectural Coatings Rule
A3	Improved Aerospace Coatings Rule
A5	Improved Surface Coating of Miscellaneous Metal Parts and Products Rule
A6	Improved Surface Coating of Plastic Parts and Products Rule
A18a	Substitute Solvents used for Surface Preparation
A20	Control of Emissions from Products Manufactured from Polysteyrene Foam, Polyethylene, and Polypropylene
B2	Improved Storage of Organic Liquids Rule (parts a, b, e, f and h)
B5	Limitations on Marine Vessel Tank Purging
C1	Improved Pressure Relief Valves at Refineries and Chemical Plants
M1	Mobile Source Emission Reduction Credit Programs
e.	Credit for Scrapping Lawn and Garden Equipment
f.	Credit for Scrapping Recreational Boat Engines

1999 — REGULATORY AGENDA

A8	Improved Magnet Wire Coating Operations Rule
A16	Improved Semiconductor Manufacturing Rule
B2i	Tank Inerting Requirements
B8	Improved Gasoline Dispensing Facility Rule
C5	Improved Wastewater (Oil-Water) Separators Rule
C6	Further Reduction of Emissions from Wastewater Treatment at Refineries
C8	Wastewater Process Drains and Sumps
M2	Reduction of Emissions from Airport Ground Support Equipment
M3	Reduction of Emissions from Ground Power Systems at Airport Terminals

2000 — REGULATORY AGENDA

A17	Control of Emissions from Household Solvent Disposal
C4	Improved Process Vessel Depressurization Rule
E1	Control of Emissions from Rubber Products Manufacturing
G3	Seasonal Controls on Organic Liquid Storage Tank and Wastewater Separator Cleaning and Refinery Shutdowns
M1b	Remote Sensing of Gross Emitters
M4	Low Emission Vehicle Fleet Operations

The following control measure will be implemented through regulatory actions spanning 1998 - 2000 since it will affect a variety of existing and proposed Air District regulations:

F7	Easing of Administrative Requirements for Use of Lower Emitting Technology

Some stationary source control measures will be implemented without regulatory action during 1998-2000. These include:

F3b	Promotion of Energy Efficiency
F6	Enhanced Compliance through Parametric Monitoring
F9	High Albedo Roofing and Road Surfacing Materials

STATE AND FEDERAL PROGRAMS THAT CONTRIBUTE TO '97 CAP GOALS

Many of the programs implemented by the Air District are required by state or federal law. However, there are many other programs developed and implemented by state and federal agencies that contribute to improving air quality. Some of the major state and federal programs that reduce air pollution are listed and discussed below. Also discussed in greater detail because of its importance is the California Inspection and Maintenance (I&M) program, called Smog Check. The effect of these state and federal programs has been included in the '97 CAP baseline emissions inventory. The '97 CAP recognizes and supports the programs

and depends on them for progress toward attaining air quality standards. The '97 CAP also supports efforts to enhance such programs to make them more effective.

State Programs

Under Cal/EPA, the Air Resources Board (ARB) has primary responsibility for protecting air quality in California. ARB develops control measures for motor vehicles, provides policy and guidance on transportation control measures, mandates improvements to consumer products and works to expand use of clean fuels. Collectively, sources affected by state control measures cause about two-thirds of the Bay Area's urban smog problem. Specific state programs include:

1. Controls on Consumer Products

    - Antiperspirants and deodorants
    - Phase I and Phase II consumer products (26 categories of household consumer products ranging from air fresheners to shaving creams)
    - Aerosol coatings (35 categories of aerosol paints and related coating products)

2. Mobile Source Air Pollution Reduction Programs

    Motor Vehicle Emission Standards
    - On-road motor vehicle emission standards
        - Light-duty motor vehicles
        - Medium-duty motor vehicles
        - Heavy-duty motor vehicles
    - Motor vehicle sales requirements
        - Low-emission vehicles (over 75 percent of new cars sold in California by 2003)
        - Zero-emission vehicles (10 percent of new cars sold in California in 2003)
    - Fuel system evaporative loss standards
    - Alternative-fuel motor vehicle emission standards
    - Certification of alternative fuel retrofit systems

    Off-road Motor Vehicle Emission Standards
    - Off-road motorcycles and all terrain vehicles
    - Heavy-duty construction equipment
    - Heavy-duty farm equipment
    - Lawn, garden and utility equipment engines

    Motor Vehicle In-Use Performance Standards
    - Motor vehicle inspection and maintenance (I&M) program (implemented by the California Bureau of Automotive Repair)
    - Warranty and durability requirements
    - "On-Board Diagnostic" systems for pollution reduction
    - Manufacturer testing and recall programs

Motor Vehicle Fuel Specifications

- Clean fuels standards - for gasoline

  Phase I
  - Reid Vapor Pressure (RVP) limits
  - Detergent and deposit pollution reduction additives
  - Leaded gasoline (eliminated January 1992)

  Phase II
  - Lower RVP limits
  - Limits on sulfur, benzene, olefin and aromatic hydrocarbon contents
  - Oxygenated gasoline program (winter only) to reduce CO
  - 90 percent and 50 percent distillation temperatures (T90 and T50)
- Clean fuels standards - for diesel
  - Sulfur content limits
  - Aromatic hydrocarbons limits

Transportation Control Measures

- Parking cash-out program

Federal Programs

Since several state ambient air quality standards are more stringent than the corresponding federal standards, the state control measures outlined above are often more stringent than corresponding federal control measures. The Air District is currently required to comply with all of the federal CAA requirements associated with ozone maintenance areas and "moderate" carbon monoxide nonattainment areas. Specific federal programs include:

1. Motor Vehicle Emission Standards

   - Regulation of fuels
     - Wintertime oxygenates gasoline program to reduce CO
     - Benzene and heavy metals limits
   - Clean-fuel vehicle standards
   - Urban bus standards

2. Nonroad Engine and Vehicle Standards

   - Light-duty construction and farm equipment
   - Lawn, garden, and utility equipment engines
   - Recreational boat engines
   - Aircraft emission standards
   - Domestic marine vessels not covered by international standards (proposed)
   - Locomotive emission standards (proposed)

3. Inspection and Maintenance (I&M) Program Requirements

4. Federal Transportation and General Conformity Requirements

Motor Vehicle Inspection and Maintenance Program

Since 1984, California has had various forms of "Inspection and Maintenance" (I&M) programs, called Smog Check. The federal Clean Air Act Amendments of 1990 set performance targets and required improvements to California's program. The current program is the product of extensive negotiations between the State of California and EPA. The program is run by the California Bureau of Auto Repair (BAR).

Types of Smog Check Programs

California now has three different types of Smog Check programs in different areas of the State. These are basic, enhanced and change of ownership areas. The air quality in an area determines what kind of program it should have. The Bay Area has been designated a basic area.

Basic Areas

A basic Smog Check program called BAR90 was in place prior to January 1, 1995. Various program improvements have been phased in since that date and some will be implemented later. Seven major improvements to the program are applicable to basic areas like the Bay Area:

- **Identification of Gross Polluters using existing (BAR90) analyzers.** BAR introduced new standards for gross polluters in July 1996. These vehicles are about 10 to 15% of the fleet, but produce 50 to 60% of the ROG and CO emissions. Gross polluters must be repaired so that emissions are below the gross polluter standards regardless of cost, and must then go to a referee station for the follow-up Smog Check. *(Partially implemented)*

- **$450 Waiver Cost Threshold.** The owner of a car that fails the Smog Check test must correct the problem. However, if the cost of emission control repairs exceeds $450, the owner is required to spend only that amount, with additional repair costs waived. Note above that different criteria are applicable to gross polluters. *(Implemented)*

- **Addition of an evaporative test.** During hot smoggy days, fuel evaporation from vehicles can produce as much as a third of their total ROG emissions. The evaporative test will probably consist of a check of the gas cap for vapor leaks. *(Not yet implemented)*

- **Random remote sensing.** Roadside remote sensing will be used to identify gross polluters. Their owners will be directed to referee stations to obtain certificates. So far, only limited field trials and demonstrations of remote sensing have been done in the Bay Area. Full enforcement of the program is expected after a review of the collected data and validation of technology and procedures. *(Not yet implemented)*

- **Improved mechanic training and certification.** Previous evaluation of the I/M program showed some problems with technicians' performance, particularly in the visual/functional test. Some vehicles that should not have passed their Smog Check tests still obtained their certificates. *(Ongoing implementation)*

- **Electronic Transmission (ET).** The new system for prompt electronic reporting began in June 1996 and ensures that test results, including gross polluter identifications, are reported immediately to BAR. It helps prevent motorists from "shopping around" for pass certificates, and provides a complete and current data set for BAR use in enforcement programs. *(Implemented)*

- **Vehicle Buy-Back and Repair Subsidy Program.** The Department of Consumer Affairs is to design and implement a program to help low-income motorists repair or scrap their vehicles. *(Not yet implemented)*

Enhanced Areas

Enhanced program areas — those with more serious air quality problems — will have two major additional program elements, due to be phased in by the end of 1997:

- **15% of the fleet is to be tested at test-only stations.** Vehicles having a high probability of being high emitters are required to have their test done at a test-only station. These vehicles are identified based on data collected from remote sensing studies and previous Smog Check results.

- **Loaded-Mode Testing.** Vehicles are to be tested using Acceleration Simulation Mode (ASM) procedures. This high-tech test measures vehicle exhaust emissions under conditions which simulate driving during moderately high speeds and accelerations. The test is particularly useful in diagnosing causes of high emissions, and reducing NO_x emissions.

Change of Ownership Areas

In those remaining areas of the State (not subject to Basic or Enhanced Smog Check) a Basic area test is administered only upon change of ownership of a vehicle.

Improving Smog Check in the Bay Area

Basic areas may request that all or parts of the Enhanced program be implemented in their area. However, state law (Sec. 44003) precludes Basic areas from requesting that 15% of their fleet be tested at test-only stations.

The Bay Area could achieve some additional emission reductions, especially for NO_x, by requesting loaded mode testing. But idle testing with BAR90 analyzers has been quite successful in identifying gross polluters. More importantly, loaded mode testing without the other program element — testing a targeted 15% of the fleet at test-only stations — is unlikely to achieve full program effectiveness.

The Bay Area would realize more immediate benefits, at lower cost, by requesting that the remaining elements of the Basic program improvements be promptly implemented and effectively enforced.

ENVIRONMENTAL REVIEW

Pursuant to the requirements of the California Environmental Quality Act (CEQA), the Air District Board of Directors in October, 1991 certified an environmental impact report (EIR) for the *1991 CAP*. Under CEQA Guidelines Section 15168, this was a program EIR evaluating a series of related actions that could be characterized as one large project. The *1991 CAP EIR* concluded that implementation of the CAP would result in numerous benefits to public health and safety through improved air quality, reduced motor vehicle use and other impacts. It also identified some secondary adverse environmental impacts, but included

mitigation measures to eliminate or lessen the severity of these potential environmental impacts.

In December, 1994 the Air District adopted an Addendum to the *1991 CAP EIR*. The 1994 Addendum evaluated the environmental impacts of the new and revised control measures in the *1994 CAP*. The 1994 Addendum concluded that the new and revised control measures in the *1994 CAP* would not result in any new environmental impacts nor require mitigation measures not previously identified in the *1991 CAP EIR*.

The Air District has prepared a Draft Addendum to the *1991 CAP EIR* which examines the potential environmental impacts associated with the new and revised control measures proposed in the *Draft 1997 CAP*. Under Guidelines Section 15164, an addendum to a previously certified EIR may be prepared if some changes or additions are necessary but none of the conditions described in Section 15162 calling for the preparation of a subsequent EIR have occurred. According to Section 15162, a subsequent EIR would not be required if: 1) the new and revised control measures proposed in the *Draft 1997 CAP* would not result in new significant environmental effects; 2) there are no substantial changes to the circumstances under which the *1997 CAP* would be implemented which would result in new significant environmental effects; or 3) there is no new information that shows either that the *1997 CAP* would result in new significant environmental effects or that new mitigation measures or project alternatives would be necessary.

The Air District has analyzed the proposed new and revised control measures, and has reviewed the *1991 CAP EIR*, other Air District CEQA documents, CEQA documents from other California air districts for similar measures, various technical support documents, and public comments on the proposed control measures. Based on this analysis, the Air District has concluded:

- The new and revised control measures proposed in the *Draft 1997 CAP* do not result in new significant environmental effects not previously considered. The *Draft 1997 CAP* includes 14 new or revised stationary and mobile source measures and 8 new or revised transportation measures. The Air District identified potential adverse environmental impacts for 9 of the 22 new or revised measures, but all of these impacts were deemed less than significant.

- The circumstances under which the project will be undertaken will not result in new significant environmental effects nor increase the severity of previously identified significant effects. Despite hot weather and high ozone readings during the summers of 1995 and 1996, ozone trends show a one percent decline per year, on average, in ozone levels since the late 1980s (See CAP Volume I, Appendix C). Implementation of the Draft 1997 CAP will continue to reduce ozone precursor emissions through the adoption of all feasible measures on an expeditious schedule.

- There is no new information of substantial importance which shows that the proposed new and revised control measures will result in significant environmental effects not previously discussed in the *1991 CAP EIR* nor increase the severity of any previously identified significant effects. Nor is there any new information which shows that mitigation measures or project alternatives previously found to be not feasible would now be feasible and would substantially reduce significant effects of the project, or that new mitigation measures or alternatives not analyzed in the *1991 CAP EIR* would substantially reduce any significant environmental effects.

For the reasons cited above, the Air District has concluded that none of the changes rise to the level of change requiring a subsequent EIR, and thus an addendum is the appropriate type of CEQA document for the *1997 CAP*. For a more complete discussion of the environmental effect of the *1997 CAP*, see the Addendum.

OTHER ISSUES

The '97 CAP is a plan to reduce ambient ozone, in accordance with state law; the '97 CAP is *not* intended to satisfy federal air quality planning requirements. Other air quality issues of concern to the Air District and to the public are summarized in this section.

Transport

The movement of air pollutants, carried by the wind, across jurisdictional boundaries is called long-range transport, or simply transport. ARB, in cooperation with local air districts, is required by the CCAA to evaluate intrastate transport and to suggest mitigation for such transport.

Most violations of ambient air quality standards occur under stagnant weather conditions, when pollutant concentrations build up because emitted pollutants do not disperse either horizontally or vertically. For ozone, these conditions occur on hot, summer days with low wind speeds limiting horizontal dispersion, and temperature inversions in the atmosphere limiting vertical dispersion. Fortunately these conditions occur on relatively few days each year in the Bay Area. The more common circumstance is the action of prevailing winds from the ocean, particularly during daylight hours. These winds sweep through the Golden Gate and other gaps in the coastal hills, then on through the Bay Area following the complex topography of the region. Prevailing winds carry air pollutants and precursors from emission points to downwind locations, mixing with cleaner air or new emissions along the way. Pollutant and precursor concentrations are much lower on windy days because emissions are dispersed through larger volumes of ambient air.

There is general agreement that pollutant transport does occur between the various air districts and air basins in California. The wind direction and resulting transport direction may well change from day to day, depending on specific weather conditions. The ARB has identified transport couples (source and receptor areas) throughout California. The Bay Area is identified as both a source and a receptor of transported pollutants.

An ARB staff report (*Assessment and Mitigation of the Impacts of Transported Pollutants on Ozone Concentrations in California*, June 1993) addressing CCAA requirements and the state ozone standard suggested that the Bay Area has occasionally been responsible for "overwhelming" transport to three locations in adjacent air basins. This assessment was based on a few days in the past when meteorological conditions were ideal for carrying Bay Area

pollutants into adjoining air basins. The three locations were Vacaville (in the greater Sacramento air basin), Crows Landing (in the San Joaquin Valley) and Pinnacles National Monument (in the North Central Coast area). Monitoring data for Vacaville, Crows Landing and Pinnacles National Monument indicate that while each of these receptor locations attains the national ozone standard, they occasionally exceed the more stringent state standard.

In recent years, emissions of both ROG and NO_x have continued to decline in the Bay Area and its immediate surroundings. If this trend continues as expected, transport impacts will also decrease as the Bay Area and its neighboring regions approach attainment of the state standard.

In order to determine whether or not instances of "overwhelming" transport occur in the future, the Air District, ARB and the three other affected air districts formed transport assessment working groups in 1994. These working groups assess data needs, perform special-purpose monitoring, share data, establish protocols for analysis, and evaluate transport impacts on an ongoing basis.

PM_{10}

There are both national and state ambient air quality standards for particulate matter with an aerodynamic diameter equal to or less than 10 microns, known as "PM_{10}". Particles less than ten microns are considered "inhalable" and thus a threat to lung function. The San Francisco Bay Area does not attain the state ambient air quality standard for PM_{10}.

The California Legislature, when it passed the California Clean Air Act in 1988, recognized the relative difficulty in managing PM_{10} and excluded it from the basic planning requirements of Section 40910.

The Act did require the Air Resources Board to prepare a report to the Legislature regarding achieving the state PM_{10} standard. This report recommends a menu of actions, many of which are already in effect or are being evaluated, but it does not recommend imposing a planning process, similar to that for ozone and carbon monoxide, for achievement of the standard within a certain period of time. The report states that "... the Board does not believe the state PM_{10} standards can be attained everywhere in California, and at all times, in the foreseeable future."

While the '97 CAP does not address PM_{10} specifically, several of the control measures in the CAP will reduce PM_{10} levels. Vehicular traffic is a major source of PM_{10} emissions throughout the year, through vehicle reentrainment of road dust and dirt. Therefore, CAP control measures to reduce trips and VMT will reduce PM_{10} as well. Oxides of nitrogen (NO_x) emissions from vehicular and stationary source fuel combustion are precursors to nitrates, which comprise a significant portion of ambient PM_{10}. Thus, the mobile source, transportation, and stationary source control measures in the CAP that reduce NO_x will also have a beneficial effect on reducing PM_{10}. The Air District's smoking vehicle program reduces PM_{10} by approximately 5 tons per day, and the NO_x controls previously adopted by

the Air District (see '94 CAP) will reduce PM_{10} by 8 to 11 tons per day when fully implemented. New stationary source control measures are expected to reduce PM_{10} emissions by 5 tons per day. Although PM_{10} emissions are expected to increase from their current 206 tons per day (see Table 1), Air District programs to control motor vehicle emissions and previously adopted NO_x measures that are among the most stringent in the nation represent a significant commitment to reducing PM_{10}.

Wintertime woodburning is also a major source of PM_{10} emissions. During the winter season, the Air District conducts its ***Spare the Air Tonight*** program to target this source of emissions and to ultimately effect voluntary reductions. Blowing dust from construction operations is another source of PM_{10}. The Air District is conducting a variety of technical studies to better understand PM_{10} in the Bay Area.

Toxic Air Contaminants

Toxic air contaminants (TACs) are of concern because these substances are either known or suspected carcinogens or they are known or suspected to cause other non-carcinogenic health effects. The primary mechanism for the development of air toxics rules in California has been through the Toxic Air Contaminant Act, enacted in 1983. This Act provides a process for the identification of TACs and for the preparation of airborne toxic control measures (ATCMs) on a statewide basis. To date, seven ATCMs have been adopted in California — five of these are now fully implemented in the Bay Area, reducing TACs from the following source categories: chrome plating, cooling towers, commercial and hospital sterilizers, and paving operations that use serpentine asbestos materials. The Air District has also accelerated the reduction of air toxics from existing sources by supplementing the ATCMs with rules developed locally, including those covering aeration of contaminated soil and water and marine vessel loading.

Since 1987, new and modified sources have been evaluated for potential air toxics impacts in accordance with the Air District's Risk Management Policy. The goal of this program is to prevent any proposed projects from creating new air toxics problems.

The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588), enacted in 1987, requires plants to prepare inventories of the air toxics emitted from all sources at their facility. Air Districts are then required to prioritize facilities based on the quantity and toxicity of these emissions. Each facility that is put in a "high priority" category is required to prepare a comprehensive facilitywide health risk assessment and then notify any individuals exposed to toxics from their facility at levels above the notification threshold of any "significant health risks" identified in the risk assessment.

The first cycle of the Air District's "Hot Spots" program was completed in 1991. Out of the 129 "high priority" facilities preparing risk assessments, 30 had risks that required public notification. The number of facilities with risks over the notification levels has dropped each year since 1991. Currently, Air District efforts in the "Hot Spots" program are focused on

industrywide risk assessments. Industrywide studies are currently underway for gas stations and dry cleaners.

In 1991, the Air District adopted the Toxic Air Contaminant Reduction Plan, which established the goal of reducing emissions from the stationary sources within the Air District's jurisdiction to less than 50 percent of 1989 levels by 1995, on a toxicity-weighted basis. The 50 percent reduction goal was achieved in 1994, one year ahead of schedule.

In 1992, California's "Hot Spots" program was amended by legislation requiring facilities with significant health risks to develop plans to implement risk reduction measures that will reduce emissions from the facility to a level below the significant risk level within 5 years. The Air District is currently participating in a statewide effort to develop program guidelines.

Global Warming

Global warming, or the "greenhouse effect," is an environmental concern that continues to be investigated and studied. In 1996, the United Nations Intergovernmental Panel on Climate Change concluded that human activity has had a discernible influence on the increase in global average temperature observed this century. Certain gaseous pollutants have been termed "greenhouse gases" because of their properties and their ability to contribute to global warming; methane and carbon dioxide are thought to be the most important of these gases. Carbon dioxide is produced from the combustion of fossil fuels. In the Bay Area, motor vehicles are the single largest emitter of greenhouse gases. Energy conservation and reducing vehicle miles traveled are the most efficient and cost-effective ways of reducing fossil fuel use. The TCMs, the mobile source measures and Control Measure F3 (Promotion of Energy Efficiency) contribute to the reduction of global warming.

In an effort to curb global warming, many nations, including the United States, have been meeting to determine whether they should commit to binding carbon dioxide (CO_2) emission reduction targets. However, since the 1990 Rio Summit, where nations pledged to return their year 2000 CO_2 emissions to 1990 levels, almost no nation is on track to do so. An exception is Germany which has successfully reduced its greenhouse gas emissions, and produces only one-half the emissions of the U.S. per person, yet has a standard of living at least as high. The U.S., the world's largest producer of greenhouse gases, has increased its CO_2 emissions by 15 percent since 1990; there has been little public interest or political initiative to address the problem.

A "Framework Convention on Climate Change" has been scheduled for December, 1997 in Kyoto, Japan to continue discussions on limiting CO_2 emissions. The goal is for the 170 countries attending this conference to finalize an international climate-change treaty that commits the nations to binding emissions reduction targets.

Reducing greenhouse gases is vital, since many plant and animal species are already being lost.

Stratospheric Ozone

While ozone near the Earth's surface is a harmful pollutant, ozone in the stratosphere, which is 10 to 25 miles above the Earth's surface, provides a protective shield from the sun's damaging ultraviolet rays. There is strong scientific consensus that chlorofluorocarbons (CFCs), and other substances containing chlorine or bromine are linked with observed reductions in stratospheric ozone. Stratospheric ozone depletion is a global problem that requires a global solution. The worldwide production phaseout of stratospheric ozone depleting substances is viewed as the solution to the problem.

The Montreal Protocol, an international production phaseout agreement, is designed to implement this solution over an extended period of time with interim production reductions designed to ease the transition to safe alternatives. In the interim period, before the total production phaseout of ozone depleting substances can be realized, actions are being taken to minimize the release of these substances to the atmosphere. The 1990 amendments to the federal Clean Air Act codify and, in some cases, accelerate the production phaseout schedule and require EPA to promulgate national rules to minimize the release of ozone depleting substances to the atmosphere.

The CAP does not address ozone depleting substances because they are not precursors to ozone formation in the troposphere (below 35,000 feet). However, the Air District Board has adopted a stratospheric (above 50,000 feet) ozone policy that is designed to reduce and minimize the release of ozone depleting substances to the atmosphere. The policy requires the elimination of exemptions from pollution reduction requirements for ozone depleting requirements contained in Air District rules and requires the development of specified CFC capture and recycling rules for specified operations. Control measures contained in the CAP are consistent with this policy.

Federal Planning Requirements

Major amendments to the federal Clean Air Act (federal Act) were signed into law on November 15, 1990. These amendments prescribe new planning requirements and attainment deadlines for areas that do not attain National Ambient Air Quality Standards (NAAQS). The NAAQS for ozone, carbon monoxide and PM_{10} are less stringent than the state ambient air quality standards for these pollutants.

The planning and pollution reduction requirements in the federal Act are, in some respects, similar to those contained in the California Clean Air Act (CCAA). The prescribed pollution reduction requirements for ozone and carbon monoxide nonattainment areas in the federal Act are generally less stringent than those contained in the CCAA, except for the requirements for motor vehicle inspection and maintenance and for oxygenated motor vehicle fuels. The federal Act requires an "enhanced" motor vehicle inspection and maintenance program, or equivalent, for ozone nonattainment areas classified as serious or worse (the Bay Area is a maintenance area subject to an "improved basic" program).

The federal Act contains planning time frames and attainment deadlines that are significantly different from those contained in the CCAA. These time frames and deadlines also vary by pollutant and level of severity. The federal Act contains a classification system for ozone nonattainment areas that includes five different classifications with varying attainment deadlines, based upon ambient levels of ozone. The CCAA contains a classification system that includes four different ozone classifications, with attainment deadlines based upon the earliest practicable date that an area can attain the state standard.

The Bay Area has attained the NAAQS for ozone and carbon monoxide. In June 1995, the region was redesignated to attainment for the national ozone standard and is now governed by an Ozone Maintenance Plan for satisfying federal air quality planning requirements. The region is awaiting redesignation to attainment for the national carbon monoxide standard.

On August 21, 1997, the EPA notified California Governor Wilson of its proposal to redesignate the Bay Area back to a moderate ozone nonattainment area, based on exceedances of the national ozone standard in 1995 and 1996. If that action is finalized, the region will develop a plan to attain the national ozone standard by 1999.

In July 1997, the EPA revised the ozone and PM_{10} NAAQS and developed new standards for fine particles ($PM_{2.5}$). The Bay Area's status with respect to these new standards has not been determined. EPA has developed a new "transitional" classification for areas that are likely to comply with the standard without additional local control measures. A number of steps must be taken before the region would have to implement any new control measures to help meet the new national standards: (1) the Bay Area would need to enhance its fine particle monitoring network, (2) EPA would need to classify the region with respect to the new standards, and (3) if designated nonattainment, the Air District would need to develop a plan to meet the new standards. This process will not be complete until after the year 2000, when the next Bay Area Clean Air Plan will be adopted.

APPENDIX A

DETERMINATION OF FEASIBLE MEASURES AND EXPEDITIOUS ADOPTION SCHEDULE

Areas that cannot achieve the 5% per year pollutant reduction target in the California Clean Air Act (the Act) can comply with an alternative requirement of the Act, Section 40914 (b) (2), which calls for inclusion of every feasible measure in a plan and an expeditious adoption schedule. However, neither "feasible" nor "expeditious" is defined in the Act.

Feasible Measures

Three sources of information have been useful in developing a working definition of feasible. These are: (1) common usage, (2) California Environmental Quality Act (CEQA) definitions, and (3) California Air Resources Board (ARB) guidance.

In common usage, *feasible* means capable of being done or dealt with successfully; suitable, reasonable, likely. (Webster's Ninth New Collegiate Dictionary, Merriam-Webster, 1988.)

In State law and in the CEQA guidelines, *feasible* means:

> "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors."

This definition is also expressed in Air District Regulation 2, Rule 2, Section 232.

The ARB provided guidance on the meaning of feasible through various documents, including:

- **California Clean Air Act Guidance Paper #1** (ARB, August 1989), which discusses requirements for areas that cannot meet the 5% reduction target: "Simply put, the nonattainment area has to show that every reasonable and necessary step is being taken to achieve State standards by the earliest practicable date."

- **California Clean Air Act Transportation Requirements Guidance** (ARB, February 1990), which includes recommendations for reasonably available transportation control measures.

- **List of Feasible Measures for Stationary Sources** (ARB, March 19, 1991), which includes recognition of administrative and scheduling constraints.

The ARB has the responsibility to review all clean air plans and to either approve the plans or notify the appropriate air district of any deficiencies (Sec. 41503).

The information sources listed above are largely compatible in terms of providing a useful definition of feasible. They were combined into the working definition of feasible for this Plan, which is as follows:

> Feasible measures are those measures which are: (1) reasonable and necessary for the San Francisco Bay Area; (2) capable of being implemented in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors; and (3) approved or approvable by the California Air Resources Board, based upon State law and ARB policies.

Air District staff periodically monitor and review regulations adopted in other California areas.

Expeditious Adoption Schedule

The Air District would like to immediately adopt and implement all new control programs in order to improve air quality and protect health as quickly as possible.

In practice, Air District staff and the Air District Board of Directors must address the measures sequentially and, for each measure, take the necessary technical, administrative, and legal steps for successful implementation. It takes from six to eighteen months (and six to eighteen person-months of staff effort) to adopt a measure. The amount of time and resources required depends on the complexity, stringency, and cost of the proposed measure and upon the size, diversity, and sophistication of the regulated community. New programs for previously unregulated sources are particularly difficult.

ARB guidance suggests at least six plan measures per year as an expeditious schedule. For the '97 CAP, the Air District will attempt an adoption schedule of eight plan measures per year on average, during the 1998-2000 period. This effort will be in addition to other non-CAP regulatory programs related to toxics, particulate matter, and updates of existing rules. The proposed schedule will require additional time from staff and Board members, because many of the measures will result in protracted rule development and adoption procedures. Legislative efforts to allow the region to pursue market-based transportation control measures will also present a tremendous challenge for staff.

For each measure, Air District staff will have to gather and analyze data, identify the regulated community, prepare control proposals, prepare mailings, hold workshops, communicate with all interested parties, refine analyses, prepare staff reports, develop delegation and/or enforcement procedures, and schedule public hearings. If additional measures are added to the regulatory schedule, staff will have to delay some originally programmed measures or seek additional resources.

The Air District's sequence of adoption for the stationary and mobile source control measures in the '97 CAP is determined by four primary considerations:

- Technical feasibility
- Significant ozone precursor reductions
- Cost-effectiveness within previously established ranges
- Flexibility and streamlining regulations

Scheduling of the transportation control measures is based primarily on availability under existing authorities and on agency resource constraints. MTC and its transportation partners have responsibility for implementing most of the TCMs.

APPENDIX B

TRANSPORTATION PERFORMANCE STANDARDS MONITORING

This appendix addresses the monitoring system for determining the Bay Area's progress toward meeting the transportation performance standards of the California Clean Air Act (CCAA). In particular, this appendix specifically states the CCAA performance standards, provides estimates of vehicle miles traveled (VMT) and vehicle trips in the Bay Area, describes the proposed monitoring approach for the Bay Area, and indicates the data collection schedule for monitoring compliance with the CCAA transportation performance standards.

CCAA Transportation Performance Standards

The CCAA requires that areas with a "serious" classification meet the following transportation performance standard: substantially reduce the rate of increase in passenger vehicle trips and vehicle miles traveled.

Estimates of Vehicle Miles Traveled and Vehicle Trips

Vehicle Miles Traveled. MTC estimates that the Bay Area VMT growth rate averaged 3.5% per year between 1980 and 1990. During this period, the Bay Area population growth rate averaged 1.6% per year. Based on these estimates, VMT grew at 2.2 times the rate of population growth. MTC travel projections used in the preparation of the 1997 CAP show that VMT will grow 21% between 1995 and 2010, an average of 1.4% per year. The Bay Area population growth rate during this period is projected to be 1.1% per year. Based on these projections, VMT will grow at 1.3 times the rate of population growth--a significant decrease compared to the previous decade.

Vehicle Trips. Between 1980 and 1990 vehicle trips grew by approximately 2.7% per year. ARB travel data used in the preparation of the *1997 CAP* show a 1.8% average annual growth in vehicle trips between 1995 and 2010. As indicated above, the Bay Area population growth rate during this period is projected to be 1.1% per year. Based on these projections, vehicle trips will grow at 1.6 times the population growth rate, compared to 1.7 times the population growth rate during the 1980 to 1990 period.

It should be noted that these VMT and vehicle trip projections are baseline data, and do not represent the effects of the TCMs proposed in the *1997 CAP*. As the TCMs are implemented, VMT and vehicle trips would be expected to decrease. Thus, the long term trend in VMT and vehicle trip growth rates, with implementation of the *1997 CAP*, would be even further reductions of historical rates of growth.

Monitoring Approach

The monitoring approach includes three elements:

- Administrative record tracking
- Traffic system tracking
- Household behavior tracking

A multifaceted approach for cross-checking and verification is required to establish accurate baselines and to provide independent methods of confirming estimates of VMT and vehicle trips. The central component of this approach is the household behavior survey. The household survey will provide statistically valid measures of vehicle trips.

Administrative Record Tracking

Administrative record tracking includes compiling data on population, auto ownership, gasoline prices, parking prices, transit fares, transit patronage, consumer price indices, fuel consumption, and household income. These data are compiled by ABAG and MTC using census data or other sources. Trends for selected Bay Area data are shown below:

	1980	1990
Population	5,180,000	6,024,000
Vehicles per household	1.68	1.76
Transit Fares ('90 $) [1]	$0.82	$0.825
Modal Share (% transit)	11.6%	9.9%
Gasoline Prices-'90 (U.S. Avg.)	$1.87	$1.22
Avg. Household Inc.('89 $)	$44,200	$52,100

Administrative data provide confirmation and context for modeling results and results derived from survey data.

Traffic System Tracking

Traffic system tracking includes the continuation and expansion of the traffic counting programs of Caltrans and local public works departments. It should also include special surveys such as license plate origin-destination surveys and vehicle occupancy counts. FHWA and Caltrans are now embarking upon a program to expand the Highway Performance Monitoring System (HPMS) to provide better statistically valid regional-level information. MTC will be working with these agencies to see how an expanded HPMS can be used by MTC.

Household Behavior Tracking

Household behavior tracking involves panel surveys or repeated cross-sectional surveys of households in the Bay Area. This effort will be an extension of MTC's 1990 household travel survey. The household travel survey is generally conducted every ten years to coincide with the census and covers over 10,000 households. However, in conjunction with the Bay Area Congestion Pricing Demonstration Project, MTC conducted a smaller household panel travel survey in 1995 of up to 4,000 households. This survey provided statistically valid estimates of vehicle trips (per household, per capita, and per vehicle) and average vehicle ridership (by trip purpose and by time of day); and time of day travel by trip purpose.

The following chart summarizes data collection for monitoring compliance with the CCAA:

CCAA Performance Standard	Data Variables	Frequency Calculated	Who will Calculate	When Reported
Reduce the rate of increase in passenger vehicle trips and miles traveled	• Vehicle Miles Traveled (VMT) • Vehicle Trips	Every two years	MTC and Air District	In conjunction with updates of the RTP. The last calculation was Spring of 1996.

APPENDIX C

AIR QUALITY IMPROVEMENT: 1986 - 1996

The Bay Area has a comprehensive monitoring network consisting of 23 ozone monitors. The present network provides good geographical coverage, and includes source areas, populated areas, and downwind concentration areas. The system has scored well on audits conducted by the EPA and ARB.

ARB requires that several measures of monitored air quality data be analyzed. One such measure is the "design value," a measure of peak pollutant concentrations. Other measures include population- and area-weighted exposure. Each of these measures has been computed for the Bay Area in this appendix, illustrating changes from a base period (1986-88) to the current period (1994-96).

Design Value

The design value serves as a measure of worst-case exposure and it relates directly to progress in achieving the state ambient air quality standard. The Bay Area exceeds the state ozone (O_3) standard at about two thirds of its monitoring sites.

In general, any concentration exceeding the standard is considered a violation of a state standard, but there are two kinds of exceptions. One is exceptional events. These are cases deemed by ARB to be beyond regulatory control, such as forest fires or dust storms. The other class of exceptions is extreme concentration events. These are concentrations determined by ARB to occur less than once per year on the average.

In order to identify extreme concentration events for a particular monitoring site, ARB computes a design value based on the most recent three years of data available. A design value is an estimate of that concentration that would occur once per year on the average. Any measured concentration that exceeds this design value can be excluded as an extreme concentration event. If there were no other exceedances of the standard, then that site would comply with the standard.[1]

[1] This plan addresses the California state ozone standard (0.09 parts per million one-hour average). The national one-hour ozone standard is similar in form to the state standard, but is set at 0.12 parts per million. Like the state standard, it can be exceeded once per year on the average. The only difference in form is how "on the average" is defined. The national ozone standard allows up to three exceedances in three years or, literally, one exceedance per year averaged over the most recent three years. In contrast, the state's method estimates a threshold above which anywhere from zero to five or six exceedances might be found in practice.

Ozone Design Values And Trends

Table C-1 lists design value estimates for the 1986-88 base period, the 1991-93 period covered in the 1994 Clean Air Plan, and the current period, 1994-96. Listed, with one exception[2] are all Air District ozone monitoring sites in operation during the entire period. In the base period, design value estimates ranged from 7.3 pphm for San Francisco to 14.6 pphm for Alum Rock (near San Jose). Livermore, a site which has experienced recent exceedances of the national ozone standard, had a base period design value of 14.5 pphm.

TABLE C-1

OZONE DESIGN VALUE (DV) ESTIMATES AND TRENDS: 1986-1996

	Design Value Estimates (pphm)[a]			Annual Percentage DV Change[b]		
Monitoring Site[c]	1986-88 base period	1991-93 (1)	1994-96 (2)	base to (1)	(1) to (2)	base to (2)
San Francisco	7.3[c]	6.0	**6.5**	-3.7	2.6	-1.5
Oakland	8.1[c]	6.6	**7.0**	-3.8	2.3	-1.7
Richmond	8.3[c]	7.8	**7.9**	-1.0	0.2	-0.6
Sonoma	10.1	9.0	**8.4**	-2.2	-2.3	-2.1
Santa Rosa	8.6[c]	8.1	**8.4**	-1.2	1.5	-0.3
San Rafael	9.2[c]	7.4	**8.8**	-3.9	6.3	-0.6
Redwood City	9.6	7.5	**9.6**	-4.5	9.4	-0.1
Mountain View	13.9	9.7	**10.0**	-6.1	1.0	-3.5
Vallejo	10.9	9.3	**10.3**	-2.8	3.3	-0.7
Napa	10.7	9.7	**10.3**	-1.9	2.1	-0.5
Hayward	12.7	8.9	**10.8**	-6.0	6.9	-1.9
Bethel Island	11.1	10.9	**11.0**	-0.3	0.4	0.0
Fairfield	11.1	10.2	**11.3**	-1.7	3.7	0.3
Pittsburg	11.6	10.2	**11.4**	-2.4	3.9	-0.2
San Jose	13.0	10.7	**11.5**	-3.5	2.3	-1.5
Fremont	13.1	11.0	**11.6**	-3.2	1.7	-1.5
Gilroy	14.1	11.6	**11.6**	-3.6	0.1	-2.2
Alum Rock	14.6	11.4	**12.2**	-4.3	2.3	-2.0
Concord	12.7	10.6	**12.2**	-3.3	5.2	-0.5
Los Gatos	13.9	11.8	**12.4**	-3.1	1.7	-1.4
Livermore	14.5	12.4	**14.9**	-2.9	6.9	0.4
Averages	*11.4*	*9.6*	***10.4***	*-3.1*	*2.9*	*-1.0*

[a] Design value estimates computed using ARB's *RECRATE* computer program. Each estimate is based on 3 years of daily high hour ozone data.

[b] Estimated percentage change equals 100(a-b)/(nb), where a is the more recent design value, b is the earlier value and n is the number of years between them.

[c] Shaded sites met the California standard during 1994-96. Sites with values labeled with a "c" met the California state standard during 1986-88.

[2] The San Leandro site did not provide reliable information during part of this period, so it was not included in the analysis. Ozone concentrations in the San Leandro area are usually in the range of those measured in Oakland or Hayward.

Ozone-conducive weather in the 1995 and 1996 ozone seasons resulted in higher design values and exposures, compared to the previous triennial reporting period (1991-93). Currently, 6 of the 21 sites meet the state ozone standard, down from 9 out of 21 in the 1991-93 period. The last three columns of Table C-1 show annual rates of change in design values. All sites showed a decrease between the 1986-88 base period and the 1994 Clean Air Plan analysis period, 1991-93. Almost all sites showed an increase from the previous period to the present. However, even with the unusually high ozone in 1995 and 1996, the average design value of all sites decreased one percent per year between the base period and 1994-96.

Ozone concentrations vary from day to day due to "chance" variation induced by the weather. One summer day may be hot with calm winds, another summer day may be cool and windy throughout the region. Ozone concentrations vary considerably based on such weather factors, and thus design value estimates, which are based on these concentrations, will also vary. There are statistical techniques to remove--at least partially--the effects of meteorology from the design value estimates. Since Livermore showed an increase in design value since the base period, a design value was calculated for that air monitoring site to illustrate the change in ozone without the effect of meteorology. Ozone levels in Livermore would have dropped approximately one percent per year with no meteorological influence.

Population and Area-Weighted Exposures

Population- and area-weighted exposure calculations provide meaningful measures of air quality improvement for ozone. Ozone design values provide information on worst-case exposures, but not aggregate exposure; design values do not indicate whether only a few people or many people are being exposed. Population exposure provides a better indication of the extent and severity of the ozone problem for human health. Moreover, the rate of progress in reducing average exposure can be very different from the progress in reducing peak ozone levels. In particular, small decreases in peak ozone translate into large decreases in exposure. Thus, even though the rate of improvement in reducing peak ozone values may be modest, the reduction in ozone-related health effects may be substantial.[3]

Population exposure is a summation of the exposures of all Bay Area residents to harmful ozone levels during a specified period. This analysis compares population exposure for three periods: 1986-88, 1991-93 and 1994-6. Area-weighted exposure is similar except that it is the summation of exposures of land areas rather than residents. The rationale for calculating area-weighted exposures is to estimate the exposure of crops and vegetation to the damaging effects of ozone.

---

[3] When the '91 CAP was prepared, the CCAA mandated that Bay Area population exposure be reduced by 25% from 1986-88 levels by December 1994 and 40% by December 1997. A 1992 amendment to the CCAA removed this requirement by reclassifying the Bay Area from a "severe" to a "serious" ozone nonattainment category. Nevertheless, the reduction in Bay Area population exposure has achieved these targets.

Population Exposure to Ozone

Table C-2 lists estimated per capita exposures for the 1986-88 base period, the 1991-93 period calculated for the 1994 Clean Air Plan, and the current 1994-96 period by county. Also listed are the percentage reductions in estimated exposure.

TABLE C-2: POPULATION EXPOSURE TO OZONE

County	Per Capita Exposure (person-pphm-hours above 9.5 pphm/total population)			Percent Decrease	
	1986-88	1991-93	1994-96	1986-88 to 1991-93	1986-88 to 1994-96
Alameda	14.0	4.2	11.4	70	18
Contra Costa	12.6	3.6	10.5	71	16
Marin	0.3	0.1	0.4	65	-25
Napa	2.5	2.2	4.4	14	-75
San Francisco	0.0	0.0	0.0	not applicable	not applicable
San Mateo	2.0	0.2	2.4	91	-18
Santa Clara	24.2	3.9	7.7	84	68
Solano[a]	7.4	2.7	6.9	64	8
Sonoma[a]	0.7	0.1	0.2	82	67
Bay Area	11.5	2.6	6.6	77	43

[a] Only that portion of the county within the Air District jurisdiction is included.

Bay Area wide, there was an estimated decrease of 77% in exposure between the 1986-88 period and the 1991-93 period, but increases in exposure from 1991-93 to 1994-96. Bay Area wide, there has been a net decrease of 43% from 1986-88 to 1994-96, but progress was not uniform. Santa Clara has shown a dramatic 68% decrease in exposure and Sonoma County has shown a similar decrease, but for the core of the Bay Area the changes have been small. Napa County has shown an increase in exposure, but the number of residents affected is comparatively smaller.

Area-Weighted Exposure

Area-weighted exposure is defined similarly to population exposure except that census tract area replaces census tract population. Thus it is the summation of the products of census tract areas (in square kilometers) and ozone excess above the standard. Table C-3 presents area-weighted exposure by county.

TABLE C-3: AREA-WEIGHTED EXPOSURE TO OZONE

County	Area-Weighted Exposure[a]			Percent Decrease	
	1986-88	1991-93	1994-96	1986-88 to 1991-93	1986-88 to 1994-96
Alameda	29.3	7.6	21.8	74	26
Contra Costa	18.9	5.1	16.5	73	13
Marin	0.2	0.1	0.2	74	9
Napa	2.8	1.7	3.5	41	-23
San Francisco	0.0	0.0	0.0	not applicable	not applicable
San Mateo	2.5	0.2	2.2	92	9
Santa Clara	30.4	6.1	10.3	80	66
Solano[b]	8.0	2.8	7.5	65	7
Sonoma[b]	1.1	0.3	0.5	77	56
Bay Area	14.0	3.5	8.9	75	36

[a] Units are km^2-pphm-hours above 9.5 pphm/km^2.
[b] Only that portion of the county within the Air District's jurisdiction is included.

Area-weighted exposures appear to be slightly larger, on average, than population exposures. This suggests that more of the high ozone levels within counties are occurring in less populated areas.

The estimated decrease in District-wide area exposure between the 1986-88 base period and the 1991-93 period is 75%. Between 1991-93 to 1994-96, area exposure increased, but still there has been a net decrease of 36% overall from 1986-88 to 1994-96.

APPENDIX D
REFERENCES

Bay Area Air Quality Management District. *Bay Area '91 Clean Air Plan* ('91 CAP). 30 October 1991.

Bay Area Air Quality Management District. *Bay Area '94 Clean Air Plan* ('94 CAP). 21 December 1994.

Bay Area Air Quality Management District. Emissions Inventory Source Category Methodologies Base Year 1990. 1 October 1993.

Bay Area Air Quality Management District and University of California Berkeley, Department of Civil and Environmental Engineering. *A Fuel-Based Motor Vehicle Emission Inventory for the San Francisco Bay Area.* Air and Waste Management Association 90th Annual Meeting and Exhibition, June 8-13, 1997, Toronto, Ontario, Canada.

Bay Area Air Quality Management District. San Francisco Bay Area Base Year 1996 Emissions Inventory. July 1996.

Bay Area Air Quality Management District. Socioeconomic Report for the Bay Area '91 Clean Air Plan. July 1991.

California Air Resources Board. *California Air Pollution Control Laws.* 1997 Edition.

California Air Resources Board. The California Clean Air Act and Closely Related Statutes. March 1993.

California Air Resources Board. Guidance for Annual and Triennial Progress Reports Under the California Clean Air Act. August 1993.

California Air Resources Board. Guidance for Using Air Quality Related Indicators in Reporting Progress in Attaining the State Ambient Air Quality Standards. September 1993.

California Air Resources Board. List of Feasible Measures for Stationary Sources. 19 March 1991.

California Air Resources Board. Office of Air Quality Planning & Liaison. Answers to Commonly Asked Questions about the California Clean Air Act's Attainment Planning Requirements (CCAA Guidance Paper #1). August 1989.

California Air Resources Board. Office of Strategic Planning. Transportation Strategies Group. California Clean Air Act Transportation Requirements Guidance (CCAA Guidance Paper #2). February 1990.

Metropolitan Transportation Commission. *1996 Regional Transportation Plan for the San Francisco Bay Area.* August 1996.

Metropolitan Transportation Commission. Update to the State Clean Air Plan: State Transportation Control Measures. 9 May 1997.

National Research Council. *Rethinking the Ozone Problem in Urban and Regional Air Pollution.* 1991.